BREAKING THE BARRIERS

A Study of Legislative and Economic Barriers to Industrial Waste Reduction and Recycling

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BREAKING THE BARRIERS -
A STUDY OF LEGISLATIVE AND ECONOMIC BARRIERS TO INDUSTRIAL WASTE REDUCTION AND RECYCLING

Prepared for

ENVIRONMENT CANADA

By

VIRGINIA F. ADAMSON, as a joint project of the Canadian Environmental Law Research Foundation and the Pollution Probe Foundation.

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FORWORD

This paper is a joint project of Pollution Probe and the Canadian Environmental Law Research Foundation. In preparing its recently published book Profit from Pollution Prevention: A Guide to Industrial Waste Reduction and Recycling, Probe researchers identified more than fifty companies throughout North America that have implemented innovative and cost-effective low waste technology. For each success story identified, there were many other companies still using conventional processing methods and generating large volumes of waste. Probe researchers quickly realized that despite the technological potential to reduce and recycle wastes, there exist economic and legislative barriers which prevent this potential from being fully reached.

Pollution Probe and the Canadian Environmental Research Foundation identified a need to examine these barriers, identify those which can be removed and propose practical suggestions as to how specific barriers can be removed and replaced with economic and legislative mechanisms that allow industry to achieve greater waste reduction.

This project is based upon the premise that there exist a number of economic and legislative barriers to increasing industrial waste reduction and recycling which can be removed by government action. The primary purpose of the project is to present to government and industry specific and viable recommendations as to how that can best be done.

1. INTRODUCTION

> "There is only one land mass, one atmosphere and a finite supply of water for us to share. To survive, let alone maintain dignified life, requires that we make the best-and least-use of these resources. If we do not sustain them, they will not sustain us."
> Doctor J. T. Ling, Vice President of Environmental Engineering and Pollution Control for the 3M Company.[1]

1.1. Pollution Prevention Pays

Pollution is more than an environmental problem. The generation of and subsequent disposal of waste has far reaching consequences: damaged drinking water supplies through ground and surface water pollution; endangered public health, particularly when contaminants accumulate in the food chain and subsequently in the human body; accelerated environmental degradation; high risk accidents and explosions; and increased resource and land scarcity.[2] These larger social problems are no longer adequately addressed by conventional pollution control systems, regulations and laws.

Until now, environmental regulations and controls have been directed to cleaning up pollution at the end of the production process where it is visible. But there is increasing recognition of preventative approaches to waste management as a means to overcome many environmental, health, safety and economic issues associated with present resource use. Industry, government and the public are considering a conservation approach to resource production, consumption and disposal through minimum use of resources and the application of low or non-polluting technology to industrial processes.

A growing number of companies are adopting preventative approaches to waste management by implementing reduction or recycling technology in their industrial processes.

In 1974, 3M Company, a transnational corporation, conducted a major program to reduce the resources, manpower and money necessary to comply with environmental laws and regulations. The "3P Program" - Pollution Prevention Pays - initiated pollution prevention at all levels of the industrial process; manufacturing, laboratory, engineering, and technical activities. Results were obtained through programs of product reformulation, process modification, equipment redesign and recovery of waste materials for re-use. Four valuable rewards resulted from these programs: an improved environment, conservation of resources, improved technologies, and reduced costs.[3]

A pulp and paper company located in Thunder Bay, Ontario, installed a counter-current, closed-cycle production process mill and other innovations to treat waste water. One of the many benefits of installing this technology was an 80 percent reduction of machinery and pulp damaging chlorides in the production process.[4]

An American electro-plating company installed a cyanide-free plating system to eliminate cyanide pollution. This process offers benefits in process efficiency and energy conservation, and has resulted in a cost reduction from $8700.00 to approximately $100.00 annually for a conventional plant.[5]

A resins manufacturing plant manager, faced with stricter pollution control regulations, used spare time resulting from the slump in the adhesives market to investigate the life cycle of chemicals. He developed several small housekeeping changes in the production process and re-educated employees regarding such changes to produce lower waste water volumes and meet the new stricter standards for sludge generation. The result was significant in that it involved no outstanding expenses and met new sewerage standards through waste reduction in the process. The procedure was so successful that an evaporation pond constructed in 1981 to handle waste water was abandoned in 1982, because of reduced need for conventional waste treatment.[6]

A small vending machine manufacturing plant in Ontario risked switching the technology of its paint coating process. Instead of investing in conventional liquid coating equipment, the company decided to try a powder coating process. Powder coatings present no solvent emission problems, are easily recycled and they have other significant low polluting properties. The company experienced real savings due to reduced energy consumption, reduced material, labor and energy requirements. The powder system saved the company approximately 15 percent more in operating costs than a conventional liquid coating system.[7]

The use of a computer in a textile manufacturing plant in North Carolina enabled the manager to create new dye formulae and other manufacturing processes, follow production costs for batch dye, and maintain strict control over the process and inventories of dyes and chemicals. Because the computer could calculate new formulae for batch dyes more accurately, batches wasted due to human error were reduced. Consequently, waste water generation was reduced substantially saving thousands of dollars yearly. The process was far more efficient and reduced operating costs.[8]

During the recession in the late '70s and early '80s chemical manufacturing industries in Canada experienced a substantial reduction in waste generation. The reduction of waste dropped off at a higher level than the drop in production. Furthermore, as production began to pick up, the level of waste generation accelerated but at a much lower rate than previously. The factors that led to a disproportionate drop in waste generation included:

a) a change in attitude of plant managers toward environmental controls, making them more conscious of the need for environmentally sound technology;

b) increased feedstock costs;
c) the unavailability of disposal sites for wastes;
d) the increased costs of land disposal of wastes;
e) the closing down of older, inefficient modules in the chemical industry during the recession; and
f) the installation of closed loop production systems in modern plants.[9]

These are some examples of companies reassessing their production processes and waste management techniques. Many companies found that through modification they were able to meet control standards, alleviate waste disposal problems, increase process efficiency and save money. These changes were made without causing profound shifts in industrial strategy. It is possible that several economic and legislative barriers have inhibited many more companies from making the same changes.

This paper reviews specific barriers to implementing waste reduction and recycling in the industrial sector; identifies how such barriers affect industry; discusses laws and policies to overcome these barriers; and makes recommendations to Environment Canada, other government agencies and industry to accelerate waste recycling and reduction activities in the industrial sector. The proposed recommendations, if applied, could motivate reduction and recycling activities in the industrial sector in Canada.

This report does not review the technological potentials to recycle and reduce waste at source in different sectors of industry. This paper focuses on industrial waste generation only and not on waste generation from the residential and commercial sectors. Needless to say some problems faced by industry in applying recycling and reduction activities may be shared by the residential and commercial sectors.

1.2 Waste Generation in Canada today

Industrial waste generation represents a large component of the waste management problem in Canada today. Industries generate both solid and liquid waste which can further be divided into hazardous and non-hazardous wastes. Rough estimates on the amount of industrial waste generated per annum are approximately 63,000,000 tons of waste in the industrial sector, 3,500,000 tons of which are of a hazardous nature.[10]

Some inconclusive estimates have been made about the percentage of waste that can be recycled. For example, the Canadian Association of Recycling Industries (CARI) estimates that approximately 23 percent of waste from the ferrous industry is now recycled and up to 65 percent more waste can be recycled. The Canadian Waste Materials Exchange estimates that 15 percent of the wastes listed in its exchange newsletter have been matched with potential users.[11]

The United States National Solid Waste Management Association estimates that as much as 20 per cent of the hazardous waste could be reduced through recovery techniques. An earlier and much less promising estimate of three percent of the 350,000,000 tons of industrial waste generated in the United States that was potentially marketable or reuseable was made by the federal Environmental Protection Agency. Zero Waste Systems, a California commercial chemical recycling company, claims that 80 percent of chemical waste now buried in landfills or disposed of through other treatment methods can be recycled.[12]

Present estimates regarding the recycling capability of wastes vary as greatly as the potential savings from waste reduction activities.[13] What is certain is that recycling and reduction activities can play a far greater role in waste management and pollution control than they do now.

2. RECYCLING AND REDUCTION ACTIVITIES: THE BASIS FOR A COMPREHENSIVE APPROACH

Attempts to incorporate preventative practices in waste management have not been coordinated in the industrial sector, or between industry, government and the public. There are several policy reasons for addressing the need for waste minimizing strategies and a formally recognized recycling and reduction program.

(a) Resource conservation

The excessive use of raw resources leads to their rapid depletion. The lifespan of resources can be extended through waste minimizing strategies. Materials that cannot be reused are landfilled, necessitating greater extraction of primary material and energy inputs. A shift to reduction and recycling activities extends the supply of natural resources, improves land use and conserves energy.

(b)Reduce environmental degradation

Recycling technology cannot of itself resolve all waste problems. But, the use of low-waste and non-polluting technologies can significantly lower effluent and emission levels as well as lower the quantity of waste generated. The use of waste minimizing technology is particularly important in addressing the problem of hazardous waste generation and disposal. The development of policies to encourage recycling and reduction in other jurisdictions have been initiated to address hazardous waste management problems in particular.[14]

(c) Minimize detrimental health effects

Environmental, safety and health problems related to conventional industrial processes, and waste management practices could decrease with the application of recycling and reduction practices.

(d) Economic desirability

The capital costs of implementing waste minimizing technologies may be high initially but, the longterm, and sometimes shortterm, effects of installing low-polluting technology are economically favourable. For the industry in question, operating costs for low-polluting and non-polluting equipment are much lower than for conventional pollution equipment, putting that industry in a much better position to meet growing inflation rates over the years. There are also substantial social costs to be saved through preventative tactics of resource re-use and reduction.[15]

(e) Promote a conserver approach to resource use

By supporting strategies of recycling and reduction technology in industry, a conservation approach to resource use and consumption is encouraged. A recent Science Council of Canada report identifies the opportunity of implementing waste minimizing strategies to promote a conserver approach in society:

> "Non-waste technologies invalidate the conventional wisdom about inevitable trade-offs between environmental considerations and "productivity" by making simultaneous improvements in producer economics and sustainability, or by providing newer and more flexible ways to accomplish objectives of environmental protection and resource economy. From this fact follows a major institutional challenge: To create the necessary combination of policy incentives to make non-waste technologies an attractive area of technological development and diffusion. Given such incentives, a commitment by industrialists to the conserver society could open up an entire new field of technological industrial opportunities."[16]

3. THE SHIFT TO LOW WASTE TECHNOLOGY

3.1 Introduction

Conventional approaches to pollution control and waste management have been limited in addressing environmental and economic issues of resource scarcity, health and safety. The shift to "non-polluting", "low-polluting" or "clean technology" represents a distinct departure from present regulatory responses to pollution abatement and waste disposal. This shift reinforces new goals of waste management by encouraging industries to:

(a) not generate the waste in the first place, and
(b) recycle or reuse the waste wherever possible.

3.2 Present Impetus Toward Reduction and Recycling Strategies

The potential of material recycling in Canada has been recognized for over a decade. Trends toward environmental conservation, rising costs of resources, stricter regulations and other factors have already motivated certain companies to alter processes and equipment to increase efficiency and decrease waste generation.

Charles Caccia, federal Minister of the Environment, recently urged Canada to make better use of recycling or "lose the battle against pollution." "The alternative," he stated is "yet another environmental time bomb on our hands." He referred to recycling as a way "to turn our garbage into money" and urged the business community "to regard recycling as an opportunity rather than a burden."[17] A previous provincial Minister of the Environment regarded reduction, reuse, recovery and recycling as presenting "the greatest challenges we face in bringing new life to waste management..."[18] An independent non-profit global research organization recently referred to the shift to recycling and reuse as "the virtue of necessity," citing the high cost of resources, resource scarcity and the waste management crisis as necessitating a recycling strategy.[19]

The NATO Committee on the Challenge of Modern Society and the European Economic Community support the concepts of material recovery and waste reduction at its source.[20] The Great Lakes Basin Commission also recommended that further attention be given to recovery and source reduction of hazardous wastes.[21]

It is only recently that Canadian federal and provincial governments have begun to consider a comprehensive policy to promote and implement recycling and reduction. Until now environmental laws and policies have focused on conventional means of waste management such as landfilling.

3.3 Conventional Pollution Control

Initial regulatory response to pollution has been limited in meeting the goal of environmental quality. There are several reasons for this. Standards and regulations that meet with objectives of environmental legislation have been administered within a system that assumes an abundancy of raw resources. Traditional regulations, or more often guidelines, have addressed pollution problems at the end of the industrial process through the application of effluent or emission standards. These standards have been met primarily through implementing conventional pollution abatement technology which controls pollution at the end of the industrial process. Until recently, little or no consideration has been given to meeting these standards through preventative solutions such as before pipe reduction technology, closed loop recycling technology or waste reuse.

The installation of pollution control equipment in response to these guidelines may affect the amount of pollution entering the environment, but does not necessarily abate pollution. In several instances more raw materials and energy are needed to meet certain end of pipe standards. Also, more waste may be generated by the process where conventional abatement technology is used. For example, conventional treatment for waste water generated by the electro-plating industry is based on an addition of chemicals reacting with soluble pollutants. The by-product is an insoluble which is then removed as wet sludge. The water is discharged to sewers. The sludge is thickened and usually landfilled.[22] Pollution is not abated but its entry into the environment is controlled and the generated waste disposed.

Standards or guidelines designed to meet the goals of environmental legislation are a reaction to a certain known consequence of a pollutant in the air, water or in the land. Pollution contol standards, guidelines and regulations for managing wastes have become more demanding in response to growing medical and scientific evidence that the application of a formally acceptable standard, by government terms, could still lead to health, safety or environmental problems. As standards and guidelines become more demanding, industry must comply by modernizing its pollution abatement equipment.

This can involve high capital costs particularly for smaller industries (even with some of the financial incentives available for pollution control equipment). Pollution control of the conventional sort then becomes costly for industries because it is capital intensive and may require modification in the near future. Michael Royston, of the International Management Institute of Geneva has noted:

> "Apart from the risk of accidents, enterprises today have to

> face the potential costs of alterations required by future legislation. These potential costs alone should make it financially justifiable to build "clean" installations. It is impossible to predict with any degree of certainty what the course of future legislation will be, except its impact will be serious. The uncertainty about the future is far worse for industry than the actual expense would be, were it foreseeable. As one Swiss industrial put it, 'I don't mind how strict pollution standards are as long as the government makes up its minds and then does not change it again.'"[23]

Conventional pollution control legislation is incompatible with waste reduction and recycling to the extent that it adopts a symptomatic approach to waste management rather than a preventative approach based on minimizing wastes.

The integration of recycling and reduction activities into present pollution control and waste management legislation represents a distinct departure from the focus of environmental law and policy today. Its integration in law and policy requires a clear commitment to resource conservation as well as environmental quality. In developing any waste management policy the primary purpose of the strategy must be clearly delineated. Is the goal of waste management regulations, laws and policies to devise standards that satisfy the public about the safety of present disposal practices or to conserve resources and deter or reduce environmental degradation? Serious consideration cannot be given to waste minimizing options unless both these objectives are undertaken.

3.4 The Waste Management Hierarchy

The federal government and several provinces have endorsed the now well established hierarchy for waste management. There are marginal differences in the hierarchies adopted, but it is basically as follows:

(a) do not generate the waste initially,
(b) recycle or reuse waste wherever possible,
(c) treat waste on the site of the generator, and
(d) treat and/or dispose of wastes.[24]

There is general acceptance by government, industry and special interest groups that the waste management hierarchy provides an optimal approach to waste management.[25] The conventional regulatory response to waste and pollution has not afforded great opportunities to effect the top priorities of this strategy. But factors such as the rising cost of landfilling, increased feedstock costs, stricter pollution standards and growing concern for environmental quality are leading to greater consideration of waste reduction and recycling.

3.5 Low Waste Technology and Waste Management

"Low waste", "non-waste" or "clean technology" are terms used to describe technologies designed to yield optimal efficiency of an industrial process, maximize the reduction of pollution at source in a cost efficient manner, and to substantially reduce or eliminate waste generation. Low waste technology involves at-source reduction, recycling or reuse activities.

Low waste technology provides an important alternative to conventional waste management and pollution control practices. Its application represents a clear commitment to the waste management hierarchy.

4. REDUCTION AND RECYCLING: DEFINITIONS

4.1 Introduction

This paper focuses on reduction and recycling potential in the industrial sector. The components of each of these areas, for the purposes of this paper, are described below:

4.2. Waste Reduction

Do not generate the waste initially. **Waste reduction includes the reduction of waste at-source by changing industrial processes, technologies and product components to minimize generation of waste.**

Waste reduction includes any of the following:

(a) process related reduction strategies such as:

(i) new product reformulation to eliminate or reduce the production of wastes
The product manufactured by a primary manufacturing company may present complex problems for a smaller secondary company. The smaller company may not have sufficient capital to install costly control facilities which may become necessary, especially if using toxic materials from the primary manufacturer. Recently some large manufacturers addressed this problem to maintain the market of small companies and have reformulated products to reduce serious environmental problems to the small industrial user.

(ii) substitution of low hazard products for toxic products
A common example is the replacement of solvent-based paints, inks and adhesives with water-based goods without a loss in performance.

(iii) plant modernization to increase product efficiency
It may be more efficient and affordable for an individual to buy an energy efficient car than to renovate or modernize an old car. The same applies to industrial processes. It may be economically sound for a company to invest in efficient processing equipment with less pollution and energy use to meet the rising cost of energy, feed stock, and stricter pollution controls rather than to modernize, renovate or retrofit the plant.[26] This is true of the dry cleaning industry where modern energy-efficient equipment is more affordable than elaborate ventilation systems which were used to modernize old equipment.

(iv) redesigning industrial processes to minimize pollution and conserve resources
For example, separating equipment is now used for many waste water streams making the water sufficiently clean for reuse in another part of the plant

process. Control of the process is improved by monitoring other processes to ensure that unnecessary waste is minimized. Many companies now conduct waste audits or inventories on a regular basis to minimize waste that is process-related.

(b) product related reduction strategies such as:

(i) increased durability, longevity and repairability of manufacturer's products;

(ii) packaging to increase the life span of a product and/or reduce or minimize waste.

4.3 Waste Recycling

Recycle or reuse of waste wherever possible:

Waste recycling involves methods of recovering wastes as resources. It includes the reuse of wastes or the collection and treatment of a waste product for use as a replacement of all or part of the raw material in the manufacturing process.[27]

Waste recycling includes:

(a) the recovery and reuse of the waste into the same process that generated it (in-line recycling);

(b) the transfer of wastes from one industry to another for reuse in another industry's process (inter-industry exchange); and

(c) waste recovery. The extraction of valuable materials in a waste stream for use in other processes, either within or outside of the industry, with or without some treatment.

5. LOW WASTE STRATEGIES - A NEED FOR CONSISTENCY

5.1 Introduction

"Reduction", "recycling", "reuse", "recovery" and "reclamation" are terms used to describe technological strategies that provide alternatives to landfilling and minimize the quantities of waste requiring treatment and disposal. The terms are often interchanged and their meanings become confused. The use of different terminology to describe generally alternative methods of waste disposal that minimize waste inhibits the development of a unified national strategy in this most complex area. Definitions are integral to developing plans for minimizing the amount of industrial waste generated in Canada.

5.2 Provincial and Federal Strategies for Waste Recovery

Provincial and the federal Canadian governments have begun to address the potential of alternative waste minimizing technologies in the management of waste. Strategies adopted to date have different titles: the Four R'S, the Three R's, Recycling Strategy or Reduction Opportunities, etc.

The Ontario Ministry of Environment, for example, refers to the "Four R's" - Reduction, Reuse, Recycling and Recovery - in its recently published Ontario Ministry of Environment Blueprint for Waste Management in Ontario.[28] In response to the Blueprint Environment Canada points to the inconsistent use of the word 'recycling' throughout the report.[29] The Ontario Waste Management Corporation refers to the Four R's as waste reduction opportunities but with slightly different definitions than those adopted by the Ministry of Environment Blueprint.[30] In discussing minimizing waste generation, Manitoba's Environment Minister, Jay Cowan, recently referred to the Three R's of reduction, recycling and reclamation and stated that these should be the long term goals of the Manitoba waste management program.[31] Environment Canada refers to Resource Recovery which includes source reduction on the one hand (before consumer consumption) and reclamation and recycling on the other hand (after consumer rejection).[32]

The adoption of different terms from province to province can engender both inconsistency and confusion in the public and industrial sectors about what waste minimizing strategies are being endorsed. There may be jurisdictional obstacles to implementing a truly national recycling and reduction strategy, but the advantages of provincial and federal governments working together toward consistent programs cannot be underrated. Definitions are integral to developing future plans for minimizing the amount of industrial waste generated in Canada. Agreeing upon basic terms can enhance information sharing and assist in clarifying what strategies are feasible and most effective.

5.3 Resource Recovery, Incineration and Solidification

With the promotion of reduction and recycling strategies for waste management has come the development of waste treatment alternatives to land disposal. Two examples are incineration or energy from waste projects and stabilization projects.

Resource recovery often refers generally to the reduction, reuse, recycling, reclamation of wastes and includes energy and materials from waste projects.[33] Energy from waste projects involve incineration in their processes. If the strategy is entitled "Resource Recovery", it may be that the program favours energy from waste programs more than the reduction of industrial waste at source or direct reuse.

Although energy from waste projects may meet the objective of energy conservation through the reuse of wastes as fuel, they cannot be considered the same as recycling or reduction at source. The promotion of these resource recovery projects over other types of waste minimizing strategies detracts from recycling and reduction potential. Consequently, the aim of reduction at source is undermined. For example, most energy from waste projects require a fixed supply of garbage to continue operations.[34] These are capital intensive projects and their long term safety has been in question because of the incineration process. The health and environmental risks connected with these projects are potentially higher than those of reduction and recycling technologies.

Stabilization and solidification involve binding the toxic waste in a solid form which is then landfilled. The advantages of the treatment are low permeability of the waste and reduction of surface area of the waste.[35] Stabilization and solidification processes may decrease the mass of waste already generated but do not contribute to the reduction of waste at source or to waste recycling generally. Nevertheless these processes are often adopted as a waste minimizing alternative to landfilling. These processes pose many of the problems of conventional waste landfilling and do not contribute to a philosphy of waste material reuse.

Recycling and reduction techniques differ from energy, waste solidification or stabilization processes. Discussions on recycling and reduction strategies often lead to their association with these projects. The recently issued Ontario Ministry of Environment Blueprint defines resource recovery as "the processing of waste from material and energy recovery" and places much emphasis on resource recovery as part of its overall "4R" program.

It is interesting to note Environment Canada's response to the Ontario Blueprint where heavy emphasis is given to energy from waste projects. Environment Canada states that the role of waste reduction is dealt with in a cursory manner and urges that:

> "some emphasis should be given to the use of process modification, general housekeeping and alternative raw materials as methods of reducing waste before it is generated in the industrial sector. In the municipal waste sector, instead of relying so heavily on resource recovery plants, more effort and emphasis should be directed to reducing the amount of waste generated."[36]

Energy from waste and other alternative processes have a role to play in waste management, but ought not to be considered equivalent to recycling or reduction in any resource recovery program. A company may not always be able to avail itself of reduction or recycling approaches to waste management. Also the techniques of each low waste approach are not mutually exclusive. Somewhere in the industrial process there will be a need for treatment or disposal of waste but that should only be after full consideration of recycling and reduction opportunities.

5.4 Conclusions

It is essential that federal and provincial jurisdictions clarify strategies being adopted to implement pollution prevention programs. Cooperation and unity between jurisdictions on the application of the waste management hierarchy as the basis for a preventative approach would enhance the effectiveness of waste reduction and recycling activities. There is also a need for agreement about what is considered recycling or reduction technology. Techniques such as energy from waste could become the focus of provincial waste management programs though they do not promote reduction or reuse of waste.

6. BARRIERS

6.1 Introduction

A barrier is any one of a number of factors that restricts recycling or reduction activities in industry. The barriers addressed here represent distinct areas where specific action could be taken to expand the use of recycling and reduction technology in industry. The specific problems identified and discussed below are:

(a) lack of financial incentives and disincentives;
(b) incomplete landfill and waste treatment pricing;
(c) pollution control standards;
(d) the lack of legislative schemes to promote recycling and reduction activities;
(v) lack of information and awareness.

These barriers represent larger social problems that have inhibited more serious consideration of waste minimizing activities in Canada.

The industrial sector in Canada represents a broad spectrum of operations which vary in size, scope and process. The barriers discussed below relate primarily to the ability of manufacturing industries to implement reduction and recycling technology in their processes. These barriers pervade the industrial sector in varying degrees. For example, larger companies tend to have the capital and research tools not available to small businesses which are necessary to implement preventative strategies.[37]

It is important to note that reduction and recycling activities influence many other parts of the industrial sector. Industries directly affected by reduction and recycling options include small and large manufacturing companies which produce first generation waste, recycling or secondary resource industries, and the waste management industry. Numerous factors affect how these different sectors consider reduction and recycling options including: competition, maintaining a competitive edge in the marketplace, technological development, environmental issues and costs.

In discussing the barriers some reference to American law and policy is made where considered appropriate. A view of what American jurisdictions have done to overcome factors inhibiting a preventative approach to waste management is helpful for several reasons. The United States has faced a greater hazardous waste management problem for several years. Many institutional and financial incentives used there could be applied here with minor changes. It is useful in some instances to consider the effects of the tools used there to forecast their relevance and applicability in Canada.

Finally, some reference is made to provincial responses to the barriers to reduction and recycling. These are outlined in chart from in Appendix A for easy reference. Also included in this Appendix are some responses from American State waste management branches.

7. LACK OF FINANCIAL INCENTIVES

7.1 Introduction

The problem of financial support for reduction and recycling activities in the industrial sector is a barrier to its more widespread use. This is a particularly serious problem for smaller industries which have neither the capital nor internal research background to implement recycling or reduction equipment to modernize their factories. In addition to the lack of incentives encouraging the use of low or non-waste technology, there are certain fiscal disincentives discouraging these activities in the industrial sector.

7.2 Cost of Implementing Low Waste Practices

(a) Introduction

The costs of developing recycling and reduction technologies can be divided into two broad categories. The first category relates to the high capital cost of investing in new equipment to more effectively minimize wastes. The second area relates to the fact that raw resource use and conventional pollution control needs are implicitly preferred in our economic system. A third area related to this latter category is transportation. The Northwest Territories, Prince Edward Island, Nova Scotia, Ontario, Manitoba and Alberta have all listed capital costs, transportation costs and the lack of financial incentives available for recycling as major barriers to implementing low waste technology, particularly in smaller industries.[38] The lack of fiscal stimulants has also been identified as a barrier to making recycled materials more competitive in the market for the Canadian recycling industry.[39]

The capital cost of investing in low waste technology may initially be high. But if the time needed to repay the cost of the added equipment and processes or the pay back period is considered, the investment is often not only sound but economically lucrative.[40]

(b) Capital Costs of Capital Investment

The introduction of competitive recycling and reduction technology may require high capital investments in specialized material and machinery as well as time to make the renovations. Financial and time constraints usually prevent small businesses from making the internal investment in research and development to improve process efficiency. Smaller operations often lack the capital that is needed to fully modernize equipment.

An Environment Canada study on the utilization of scrap metal in Canada, for example, identifies costly separation technology as a barrier to increased recycling of scrap metals.[41] A study on fiscal instruments in the re-refining of oil also identifies high capital investment as a problem.[42]

Another reason that companies may be reluctant to make the investment relates to general attitudes that pollution prevention investments are costly.[43] The question arises as to whether a company evaluates investment decisions about waste prevention using the same criteria applied to investment decisions for other business-related equipment.

Companies will make decisions regarding capital investments based on the rate of return or payback period of the equipment. The rate of return is the time required to cover the cost of the investment based on the added income generated from installing more efficient equipment. In some cases, pay-back periods for installing new recycling equipment can be as low as two years because of the significant value of recovered materials, although the cost of borrowing may add more time to the rate of return.[44]

Investments in low waste technology equipment most frequently provide greater financial benefits to an industry. Generally, a company that has invested in recycling or reducing equipment on site will have large capital expenditures initially, but lower operating charges in the longer term. Operating costs will become lower as process efficiency improves and costs of transporting waste off site (e.g. for landfilling) decrease. A company making these investments will also avoid added costs of inflation experienced by operations with conventionl technology.

It is also important to note that large capital costs are not always required to improve process efficiency. Large capital costs should only be made after the industrial process in use is assessed to determine how minor changes can improve process efficiency. At this point a company can better determine whether the capital investment is justified.

(c) Pricing Discrepancies

(i) Introduction

Until recently, market conditions were based on the assumption of an abundant supply of raw resources. The excessive use of raw resources has not been discouraged. Pricing at this time may not reflect the value of raw resources in relation to their depletion rate when not reused, their scarcity, or the environmental effects of their extraction and subsequent disposal. If these costs were added to the price of raw resources, the possibility of secondary resources becoming more competitive in the market would increase.

(ii) Landfill Pricing

Landfilling and waste treatment prices generally do not reflect the true cost of disposing of these wastes in perpetuity. The marketplace should reflect the true cost of waste generation and eliminate all undue use of raw resources. This is discussed in Section 8.

(iii) Incomplete Costing of Raw Resources

This issue has again been raised by the secondary resources industry.[45] There is no question that there are structural imbalances in our pricing policies and that the value given to raw resources does not reflect their growing scarcity. This is a difficult problem that requires further research and is beyond the scope of this paper. It is raised here because such imbalances implicitly discourage alternative reduction and recycling technologies.

(d) Transportation

(i) Introduction

There are two issues regarding transportation that appear to affect recycling: mobility and preferential rates.

(ii) Mobility

New Brunswick, P.E.I., Alberta and Newfoundland have raised the issue of transportation as a barrier to recycling and reduction.[46] Canadian geography makes transportation an issue to be considered in waste management practices. The cost of transporting waste over water or long distances can inhibit its reuse where there are other more readily available and cheaper means of disposal. The problem of mobility could be addressed through the expansion of regional waste exchanges. If waste exchanges were regionalized and more widely publicized the need to transport waste over long distances to effect its reuse could be largely overcome. Waste exchanges are discussed below in Section 11.

(iii) Preferential Rates

The recycling industry has raised discriminatory transportation rates as a major impediment to recycling and reduction activities in Canada. Some industry representatives have stated that the freight classifications for recycled as opposed to raw materials are inequitable and that the rate structure favours the transport of primary materials. There has been no response or findings of actual rate discrimination at this time. One study done for the now defunct Ontario Waste Management Advisory Board investigated discriminatory transportation rates.[47] Some of the conclusions of that preliminary study were:

(1) Discriminatory rates may exist to the extent that rates exist that affect all low volume items.

(2) The jurisdictional framework for rate review proceedings is not well developed in Canada and government transportation analysis is based on industry produced costs.

(3) The expense and time involved in a discriminatory hearing under the Ministry of Transportation and Communications is beyond the scope of most appellants. The issue of rate discrimination will therefore not likely become commonplace.

There does not appear to have been any further research based on these conclusions. Rate discrimination has been found in the United States where transportation rates have always been subjected to heavy regulation.[48]

Some preliminary investigation in rail rates for raw and scrap goods indicates that in certain hypothetical situations there are preferential rates for metal as opposed to scrap metal and wood as opposed to wood chips though there are not discrepancies in hypothetical situations involving other wastes.[49] This is an area that merits much more research to confirm or deny discrimination.

A recent national recycling policy paper endorsed by the Canadian Association of Recycling Industries recommends the establishment of preferred rates for material to be recycled as a way of removing barriers to mobility.[50] A recent questionnaire to representatives in the recycling industry saw a need for preferential freight rates as one way of giving secondary resources a "push" towards equity in a market and tax system primarily geared toward primary goods industries.[51]

(iv) Conclusions

Mobility does appear to present a serious problem in the Maritime provinces and wherever long distances are required to transport scrap or waste to other areas. Although no evidence of discriminatory rates for recycled goods has been found, this is a complex issue that merits greater research and investigation.

The mobility barrier could be overcome through subsidies or special rates for recycled goods. The area of preferential rates for goods to be recycled should be investigated and considered further as a means of encouraging recycling. There may be instances where the true cost of transporting scrap is much less than that for the raw resource in question. Greater use of regionalized waste exchange would also assist in limiting the sphere of transportation distances that now may be necessary to reuse waste.

7.3 Forms of Incentives or Disincentives to Preventative Waste Management

(a) Introduction

It has been a practice of the federal and provincial governments in Canada and elsewhere to encourage broader social goals through direct and indirect assistance. Assistance and incentives take the following forms:

(i) direct subsidies, grants, interest free loans, etc.,
(ii) indirect subsidies such as taxation policies, or programs funded largely or totally by government finances, or disincentives in a taxation of other practices,[52]
(iii) scheduled pricing discrepancies (discussed above).

General market conditions may motivate industries to gradually turn to recycling and reduction, but specific fiscal measures can quicken this shift and enhance high rates of resource recovery. In the past, fiscal policies have been developed to encourage energy conservation, oil conservation, or discourage activities through surcharges on luxury items, such as cigarettes and alcohol. Fiscal assistance has long been recognized by government, industry and special interest groups as an important method of encouraging recycling and reduction activities in Canada.[53] Financial assistance programs and policies encourage low waste technology are described below. They are few in number. While some other programs are in place that could support recycling and reduction, they are usually part of broader funding programs, for example, industrial development.

(b) Direct Incentives for Reduction and Recycling

Programs that specifically address resource conservation technology are the Environment Canada sponsored D-RECT program, and the Industrial Research Development Program and the Industrial Research Assistance Program.

(i) D-RECT Program

The D-RECT program -- The Development and Demonstration of Resource and Energy Conservation Technology -- is a program co-sponsored by the federal Ministry of Energy, Mines and Resources and Environment Canada. D-RECT provides subsidies to projects which target the reduction, recovery or recycling of wastes, or energy conservation. D-RECT will pay up to half the total cost of an approved project. A condition of funding is that the project proponent undertake to make patents and technical information available upon conditions that are agreeable to the parties.

The D-RECT project began in 1978 and has sponsored a variety of projects ranging from waste glass recovery projects, composting, to energy on materials from waste products. Appendix B shows the types of projects that have been funded under the D-RECT program. Many of these projects are directed to energy conservation, not to waste reduction. General funding under D-RECT is quite low. Although funding for D-RECT has tripled since the inception of the program in 1978, the annual budget for D-RECT is still under $1 million.[54]

(ii) DREE

DREE -- the Department of Regional and Economic Expansion -- was created in 1969 to encourage each region in Canada to realize its economic and social potential. At that time, the mandate of DREE was to draw together existing successful programs and develop new approaches for purposes of economic expansion and job creation in the regions of Canada that were less well developed.

DREE is considered the "focal point for addressing economic disputes" and is operated so that federal and provincial departments work together and subsidize agreements. Projects funded or subsidized by DREE that relate to waste reduction or recycling included, in 1981, the pulp and paper mill modernization projects in the Atlantic regions, Quebec and Ontario to encourage pollution abatement and industrial modernization within the private sector.[55] DREE has been criticized for investing large sums of money in large companies with significant capital resources which do not need direct government subsidies.[56]

In October 1981, the formation of a Canadian Industrial Renewal Board, made up of the deputy minister of Industry, Trade and Commerce and of the deputy minister of the Department of Regional and Economic Expansion and other industry representatives, was announced. The Board has as a mandate the assistance in restructuring, consolidating and modernizing industries in the textile, clothing and footwear fields, and to help renew the economic conditions of communities dependent on such industries.[57]

(iii) Creation of IRDP

In 1983, the DREE program was reorganized under Bill C-165 and renamed the Industrial and Regional Development Program - IRDP. The new program is apparently to be more regionally sensitized than DREE and is to combine the expertise of Industry, Trade and Commerce and DREE.
The Enterprise Development Program - EDP - now falls under the IRDP program. The general scope of EDP initially was to provide financial assistance to qualified companies while taking advantage of available opportunities to promote industrial innovation. Assistance was provided through loan insurances made by private lenders to manufacturers and processors where normal financing was not available. Contributions of up to 75 percent of eligible costs for research, development and design projects was the other mode of assistance for projects that put a significant burden on a company's resources. The EDP had a specific

element for pollution abatement. Under the EDP program there were only four pollution abatement projects approved from a total of 920 project approvals in the area of product design, productivity enhancement and product development between 1981 to 1983. These projects included a recovery process in kraft and pulp manufacturing, the de-inking process in recycling paper, the reduction of sulphur emission in tar sand operations, and disposal-related projects.[58]

The IRDP also has provisions for financial assistance of research and development programs, demonstration or adoption of new or improved technology, products and production processes, equipment or facilities if the object of the research is the elimination of reduction of pollution. It is hoped that the new program will expand its application to low waste technologies.

(iv) IRAP - Industrial Research Assistance Program

IRAP is administered by the National Research Council and is a federal program that has been established to further economic development in Canada. The focus of the program is to encourage research and development and increase the use of science and technology.

Under the IRAP program, scientific, technical, research and development resources of the National Research Council and various provincial research organizations assist industry in a range of industrial research developments across Canada. The program is composed of six elements which include an advisory program on government assistance, an advisory program on existing technology, a short term employment program to assist in solving industrial programs, a short term experimentation program (IRAP-L), a research development program for small, research and development projects (IRAP-M), and for longer term, higher-risk projects (IRAP-P).

IRAP-F, previously named the Technical Information Program, provides that information on new technology be communicated to industry either in the course of operating a technical awareness program or through replying to specific enquiries about technical matters. Approximately 2 percent of the questions that IRAP-F receives deal directly with waste recycling and about 2 percent of material input into current awareness programs concerns industrial waste recycling.[59]

Most resource reduction or recycling projects would be IRAP-assisted under the M and P program elements. At this time, the rate of proposals not funded under this program element is comparable to the overall rejection rate for IRAP projects, about 22 percent.[60]

Although the scope of these two program elements is broad enough to apply to recycling and reduction technology, they are not widely used in these areas. A breakdown of the resource reduction and recycling related environmental projects funded under the M and P elements is shown in Appendix C. Only 55 projects have been IRAP-assisted between 1967 and 1983 in the area of resource recycling, reduction or pollution abatement. Their success rate is about 36 percent, pollution abatement projects having been the least successful.[61]

(v) Provincially Assisted Programs

Quebec has recently initiated a financing program for industrial recycling within their industrial incentives program.[62] British Columbia also has a technical assistance program which covers half the consulting costs and up to a maximum of $5,000 for to productivity improvement. This may cover the implementation of reduction and recycling technology. The B.C. Ministry of Industry and Small Business Development also funds a low-interest loan assistance program for new equipment purchased by manufacturers. Only one project under this program has been directed to recycling and this fell through because of poor capitalization of the firm.[63] No requests have been made apart from the above in regard to recycling and reduction assistance. The Manitoba government has no formalized financial assistance program to provide direct assistance in the implementation of low-waste technology.[64] The same is true in Ontario, although there are some financial assistance programs available for facility design, process selection and product development which could assist in implementing recycling and reduction technology.[65]

(vi) Conclusions

Although there are some federal[67] and provincial programs that could provide funding for resource reduction and recycling technology, few of the projects funded involve the implementation of recycling and reduction technology. It is difficult to estimate government subsidizing of recycling and at source reduction activities through these programs as assistance often falls under very broad terms of technological innovation and modernization.[67] It does appear, though, that not enough money is being invested in assistance programs for recycling and reduction technology.

The other major problem with existing programs of financial assistance relates to the lack of interest actively demonstrated in reduction and recycling. It appears that few requests are made for assistance in the area of capital investments for recycling and reduction technology.

There are likely two correlating factors creating this trend. Generally, existing programs that could assist an industry in investing in research on low waste technology do not advertise that recycling/reduction technology may be covered through their financial assistance programs (D-RECT is one exception). Also, industry is not aware of the potential of using these programs to develop recycling and reduction technology.

More funding for research and development of low waste technology, and low interest loans to assist capital financing of recycling and reduction technology could provide meaningful assistance to companies investigating low waste options. It would also help if more funds were allocated to educational institutions to encourage research and specialization in low waste or clean technology. Industry and provincial and federal governments could contribute to expanding the use of low waste technology in industrial processes through financial assistance, scholarships and research funds.

(c) Indirect Subsidies

(i) Introduction

Income tax legislation could provide incentives for recycling and waste reduction in the industrial sector. At this time income tax laws do not have incentives for industry to recycle or reduce wastes, but encourage conventional technology and industrial practices. Three examples of this are:

(1) the accelerated capital cost allowance;
(2) the depletion allowance under the Income Tax Act; and
(3) the sales tax provisions under the Excise Tax Act.

(ii) The Accelerated Capital Cost Allowance (ACCA)

(a) Introduction

The only taxation mechanism existing at this time that can be used to encourage the implementation of recycling and reduction technology is the accelerated capital cost allowance provision under the Income Tax Act. Interpretation of this section indicates that it can also be used to reject some recycling/reduction projects and that its real focus is on encouraging investment in conventional abatement equipment.

(b) ACCA: How It Works

Under the federal Income Tax Act there are specified classes of capital assets. The Income Tax Act provides a deduction allowance for these classes on a percentage basis reflecting their accepted rate of depreciation. Regulations under the Act designate over 30 classes of depreciable capital assets and their rates of write-off. Some classes have an acceptable allowance that is much higher than the accepted depreciation rate. In this case, the capital cost allowance is accelerated. An accelerated capital cost allowance is allocated to certain classes of assets to encourage investment in equipment to be used in specific activities.

The capital cost allowance provides taxpayers with a means by which the capital cost or depreciation cost of assets can be deducted in determining taxable income. Where the capital cost allowance is accelerated, it affords a greater rate of deduction in early years of investment, thereby easing the burden of investment in certain capital equipment for specific activities.

(c) ACCA for Pollution Control Equipment

There is an accelerated depreciation rate, for example, for pollution control equipment whereby capital expenditures incurred to control air and water pollution can be written off in three years.[68] (See Appendix D). Environment Canada administers this provision and will accept structures, machinery and equipment under this class. This provision allows a rapid write-off period of three years. The provision is available for conventional pollution control equipment. Some recycling and reduction equipment investments could be written off through the pollution control allowance, but there is a grey area where recycling and reduction equipment equipment are ineligible.

Applications within the accelerated class must meet three requirements. Two basic tests must be met under the provision:

(i) The measure in question must relate to pollution abatement. In other words, does the equipment prevent, abate or eliminate pollution?
(ii)The measure in question must have as its primary reason pollution control measures.

The provision also requires that the investment be made for abatement equipment in a facility the construction of which had commenced prior to 1974.

These requirements indicate that the provision was enacted to encourage industries to invest in conventional pollution control equipment in anticipation of mandatory compliance with pollution control guidelines. Many environmental control guidelines were drawn up and applied under environmental control legislation which became effective in the early seventies. Low waste technology often results in money savings and pollution reduction. Conventional pollution abatement equipment will control pollution levels in the environment but do not contribute to process efficiency or consequent financial savings.

About eight percent of all applications under the accelerated capital cost allowance provisions in this class are rejected. Some of the rejected applications involve recycling and reduction equipment that has been installed. Because of substantial money savings and high rates of return it can be determined that the primary reason for this installation is not pollution abatement but rather economic efficiency. This provision may not be available in situations where recycling and reduction equipment is installed and there is consequent substantial money saved through cleaner operations in the process.[69]

The tests that must be met under this ACCA provision suggest that pollution control is, and ought to be, a financial drain. There may be some logic to not subsidizing a profitable recycling or reduction project, but ACCA should be shifting its focus from pollution control to pollution prevention. The current form of ACCA has been directed to environmental strategies of the last two decades, but it must change to meet the challenge of pollution prevention in the future.

The accelerated capital cost allowance for pollution control equipment may assist industries to comply with stricter environmental standards by providing fiscal assistance to them in the purchase of pollution control equipment. It does not act as an incentive for investment in recycling and reduction equipment. Although these investments will often reduce pollution and waste generation significantly, the primary purpose test mentioned above can adversely affect a firm installing recycling equipment, as the result can be financial saving as well as a cleaner operation.

The focus of this section is very general and does not address recycling/reduction equipment specifically. It will not alert industries to the overall benefits of investing in reduction and recycling technology to meet environmental protection standards and guidelines.

The addition of another class dealing specifically with recycling or reduction equipment without the primary purpose test might help to motivate industries to invest specifically in recycling and reduction wastes equipment. If the provision afforded a two or one-year rate of write-off, the implementation of low waste technology would be encouraged. Favouring industrial use of recycling and reduction equipment over conventional equipment would encourage compliance with environmental control legislation and also resource and energy conservation, clean technology and process efficiency. With such changes, ACCA could become a very important tool with which to direct industry toward waste reduction.

(d) Other ACCA Provisions

There are other accelerated capital cost allowance provisions that implicitly discourage the use of recycled goods or reuse of wastes in their processes because they provide positive incentives to industries to continue using raw resources. For example, there are increased rates of depletion of assets required before the commencement of a commercial production of a new mine commences or for the purpose of expanding an existing mine. The cost of clearing and removing overburden at a mine site after commencing commercial production can be capitalized and up to 100 percent of these costs written off in one year.

(iii) Depletion Allowance and Exploration Expenses

There are several other provisions under income tax legislation which act as negative incentives to the use of secondary resources as they encourage investment in raw resource production. Up to 100 percent of Canadian Exploration Expense (CEE) could be written off against any source of income by individuals or corporations whose main business is not exploring or producing petroleum, natural gas or minerals. (After 1981 the depletion allowance did not apply to individuals.)

Depletion allowances under the Income Tax Act provide an extra deduction to the taxpayer after all the actual expenses of exploration and development have been deducted. Its purpose is to provide an added incentive to invest in areas where higher risk may be perceived such as mining and petroleum industries. While some of these provisions are being phased out, others remain as incentives for continued investment in raw resources while detracting from wider use of recycled goods.

(iv) The Excise Tax Act

Under the Excise Tax Act a consumption or sales tax is levied on the sale or consumption of goods manufactured or produced in Canada, or imported into Canada. The Act provides as well for an excise tax on other goods such as tobacco, jewellery, coin operated games and amusement devices as well as certain automobiles. The Act provides for both unconditional and conditional exemptions on certain goods.[70]

At this time some recycled goods, such as re-refined oil, are subject to the Act in two instances: at the time the good is a raw resource and at the time the good, after use, is to be reconsumed as a recycled good. Originally, re-refined oil was exempt from application of the Act. This decision was reversed in 1972.[71] At that time re-refined oils blended with additives were included as "taxable processes of manufacture" and had to be accounted for with tax on their taxable sales. Re-refining is a term used to describe the physical and chemical treatment of used oil, particularly automobile oil, for recycling and reuse of its lubricating properties. Re-refining is one method of recycling used oils which diverts its use from less sound waste management practices, such as road oiling, burning and dumping. There are millions of gallons of used lubricating oil available for reuse every year, only a small proportion of which is now being re-refined.[72]

The Canadian re-refining industry has requested that re-refined oil be exempt from the Excise Tax Act requirements. They have stated that the source of used oil was initially taxed and in reimposing a tax on the re-refined product, the product is essentially being double taxed. With the additional sales tax on the re-refined product, the price is comparable to that of virgin crude oil and takes away a possible incentive to the consumer to purchase that product. Representatives of the re-refining industry have stated that the imposition of this federal sales tax places a significant disincentive on the use of used oils in Canada. They have argued that the amount collected by Revenue Canada through the imposition of this tax is drastically less than taxpayers pay each year to replace over 200,000,000 gallons of lost used oils.[73]

7.4 Conclusions

The direct and indirect disincentives mentioned in this paper affect reduction and recycling of resources in two ways. Disincentives drain investment capital from recycling and reduction activities in industry and rechannel capital in areas implicitly favoured through our tax and economic structure. Second, fiscal incentives and disincentives entrench the use of raw resources in industry and drain motivation for industry to explore the potential for recycling and reduction activities. There is a real need for more research and development grants and other incentives directed to recycling and reduction activities in the industrial sector. Industry and government can work toward this goal in several ways.

7.5 Recommendations

It is recommended that Environment Canada:

(a) **Expand its budget for research and development into recycling and reduction technology.**

Research and development assistance to industry would not be in the form of subsidies. Rather, financial assistance could be available in exchange for research and development relating to recycling and reduction. Assistance could follow the format of the D-RECT program but should have much better funding.

Assistance should be different than that offered under the D-RECT Program which assists projects, such as energy from waste, which are capital intensive and do not enhance resource reduction. Programs providing research and development assistance could encourage research and development in the areas of waste reduction and waste reuse internally, and into the means by which other wastes could be recycled. Such programs could be divided to assist research and development investment in recycling for smaller industries which otherwise do not have capital immediately available to do so.

(b) **Encourage a more equitable view of recycled goods in income tax legislation (see recommendations for Revenue Canada).**

(c) **Promote information packages on financial programs now available to assist industries in investing in recycling and reduction equipment.**

(d) Conduct further research on different transportation policies to implement preferential rates that would assist in the mobility of recycled waste, particularly in the Maritime Provinces and areas where industry is isolated from concentrated areas.

(e) Generally initiate more programs specifically directed toward financial assistance of industrial recycling and reduction activities.

It is recommended that Revenue Canada amend income tax legislation to include:

(a) A provision for an accelerated capital cost allowance for investments in recycling or at source reduction equipment.

A rate of write off of one to two years is recommended to encourage investment in low waste technology and in preventative practices rather than in conventional pollution control.

(b) Amendments to the Excise Tax Act to exempt re-refined oil and other recycled goods from its application to encourage preferential purchasing practices for these goods.

(c) Implementation of an income tax credit for industries that have invested monies in a given tax year for operating or research expenses relating to reduction and recycling.

For example, waste audits, participation in waste exchanges, or research and development into making the industrial process more efficient and lowering the amount of waste being generated could be subject to a credit.

It is recognized that Environment Canada will play an important role in developing these amendments. It is also recommended that Revenue Canada, in conjunction with Environment Canada, develop provisions encouraging a more equitable view of recycling and at source reduction potentials.

It is recommended that provincial governments:

(a) Allocate money to educational institutions to support research and development activities in the area of recycling and reduction in the industrial sector and specialization in waste minimizing technologies as a field of study.

(b) Develop tax credits for small businesses conducting research or investing in innovative recycling and reduction activities.

(c) Implement low interest loan grants for investments in innovative clean technology.

(d) Develop research and development grants for innovative work in the area of recycling and reduction in the industrial sector.

(e) Conduct research with the federal government on the effects of transportation rates on raw goods, recycled goods and on recycling options generally.

It is further recommended that industrial associations:

(a) Make further financial contributions to educational institutions, and industry to encourage more specialised research into low waste technology.

(b) Develop information packages on financial incentives available for implementing low waste technology.

8. WASTE DISPOSAL PRICING

8.1. Introduction

The low cost of landfilling waste has been a major obstacle to motivating industries toward waste technologies eliminating waste as opposed to those destroying potentially valuable resources. Several provinces have identified landfill costs as a major problem in implementing recycling and reduction in a waste management scheme.[74]

8.2. True Cost of Landfilling

The price paid to dispose of waste is the amount paid, if any, by waste haulers or generators for disposal of the waste. The true cost, on the other hand, includes social, environmental, economic and other losses incurred when wastes are disposed of in perpetuity. These include, for example, environmental degradation due to landfilling; loss of land; resource losses destroyed at the time of landfilling; health problems; administrative costs such as those of super funds to cover future liabilities; the cost of holding environmental assessments and other public hearings to decide whether a proposed site is appropriate; the maintenance of a system, etc. At this time, costs of landfilling are largely subsidized by government and the public. This is especially true of municipal landfills sometimes used by local industry at minimal cost.[75]

The charts in Appendix E are representative of present prices for landfilling. Chart A shows the cost of landfilling from 1971 to 1980 in Toronto and shows how these costs have increased due to the higher demand for landfill. Charts B, C and D show a comparison of landfilling with other treatment methods in Canada (1983 figures) and in the United States (up to 1981). Toronto prices show that although the cost of landfilling is rising, the cost of sanitary landfilling is still relatively low and does not reflect the social cost of waste disposal in perpetuity. Charts B, C and D show the rising costs of more complex waste treatments.

There is general agreement among industry, waste management associations, environmentalists and government, that the pricing structure for sanitary and secure landfilling is a major barrier to the use of alternative means for minimizing waste. As long as landfilling is relatively cheap, it is financially attractive for many industries to continue investing in disposal rather than in implementing low waste technology.[76]

8.3. Raising the Cost of Treatment and Disposal

Two arguments are raised as to conditions that will most effectively raise the cost of landfilling and increase the use of reduction and recycling technology.

The first argument is that the cost of landfilling will rise as pollution control regulations and waste management regulations become stricter. This and other factors, such as higher demand for land and higher transportation and treatment costs, will gradually cause costs to reflect true costs. As the prices of landfilling and costly treatment methods increase due to government regulation, scarcity of landfilling and long term treatment services, high demand, and further administration costs (e.g. insurance), industries will naturally turn to alternative waste minimizing technologies without other artificial or added incentives.[77]

The second argument is that a user fee or surcharge be imposed on the present price of disposal and treatment methods to raise the costs to reflect a higher cost. The money raised can then be used to support research and administration costs for recycling and reduction programs. It is contended that stricter requirements from government and other economic conditions are not sufficient to raise the cost to reflect true cost. While stricter regulatory demands may be necessary to meet needs of higher standards of environmental and health quality, these standards are not imposed to increase the cost of waste treatment but to promote environmental and health safety objectives. These regulatory conditions only indirectly affect the cost by adding a surcharge on the disposal and waste treatment. A surcharge meets the problem of true cost directly and has been applied in some American States.

Although economic conditions affecting waste management practices are changing and may eventually encourage more use of waste minimizing technologies, the shift will be slow and not necessarily comprehensive. An added levy could serve as an impetus to more quickly effect changes that might otherwise occur only very slowly, if at all, as our economic system has not discouraged the excessive use of raw resources, and pollution abatement has focussed on end-of-pipe controls. Without an added charge, it might be difficult to encourage changes in waste management practices. Furthermore, the cost of disposal may still not reflect the true cost of disposal, as this is a very difficult cost to assess.

Finally, there is also the possibility that the natural rise in disposal prices, without any added fee, will be used to find more elaborate means of disposal in the ground and not methods of minimizing waste generation. One American company that is developing approaches for minimizing and reusing waste has stated:

> "landfills should pay for their own demise through a system of fees intended not to subsidize resource destruction but resource recovery. This has never been done.... The money pouring into the landfills is going for lobbying and research into even more fantastical ways to throw away waste without taking responsibility for their fate. Against this kind of competition resource recovery (programs) may be

> swamped. No state or federal agency has even allocated one single dime to the area of resource recovery of chemical wastes."[78]

Given the above factors, it would appear that the most immediate solution to the problem could be regulation of the cost of disposal under a user fee or surcharge system. The user fee could be channelled into programs that promote reduction and recycling. Imposing and enforcing such a surcharge on waste disposal operations is relatively easy if record keeping and reporting requirements are in place.[79]

The motivation needed to encourage industry to minimize waste is based on awareness of the true cost of waste disposal, and on the potential value of that waste as a co-product.[80] For this reason a surcharge used as an investment in waste minimizing technologies could be a valuable tool. As the cost of landfilling is raised to reflect the true cost, waste generators will become more aware of the real cost of waste. If the money levied is channelled into waste minimizing programs, industries and especially smaller industries that would otherwise not have resources immediately available to shift their waste management techniques, will have the information and incentives available to do so.

8.4. Canadian Regulatory and Economic Response to Landfill Costs

To date there has been no formal response in federal law or policy to raising the cost of landfilling. After instituting a program to encourage recycling three years ago, the Province of Quebec has changed its pricing structure for disposal. To attain the objective of recycling as a top priority, the provincial ministry prohibited toxic wastes from disposal in sanitary landfills in 1978. At the same time various solutions to the problem of eliminating waste were implemented and a policy was proposed that a fee be levied at disposal sites as a means to fund these programs. At this time, Stablex, a stabilization treatment plant in Blaineville has been established. Serdoq, an incineration plant, will be operating in the near future. The price of treatment and waste disposal is now higher, though perhaps not reflecting the true cost. It is hoped that this will encourage companies producing toxic wastes to consider more seriously optimal recycling.[81] Stablex has a contract with the Quebec government to contribute a portion of the money it receives for waste treatment to a fund (the contracted fee is estimated per ton of waste) to support research in the area of recycling and recovery of industrial wastes. A similar contract will be struck with Serdoq and any other company treating waste in Quebec. The charges will be levied by Stablex after June 1984 and will be put into a special research fund to be administered by the Quebec Ministry of Environment, Stablex and Le Centre de Recherches Industrielles de Quebec.[82]

It is difficult at this early stage of the program to evaluate its impact.

The use of incineration and stabilization for non-recycled waste may be important interim measures but could detract from materials conservation if proper programs for recycling are not implemented. It is the view of the Ministry that the pricing strategy adopted will, in the long run, encourage reduction and recycling in Quebec. It is the Ministry's view that as industry assumes the real cost of waste disposal, it will regard the recycling reduction options more favourably.[83] It is unfortunate that the surcharge administered without any input or representation from the public generally or from environmental groups.

Alberta and Ontario are both considering true cost fees for treatment of hazardous wastes.[84] In Alberta the establishment of the Hazardous Waste Treatment Plant for the province will likely result in higher treatment costs which, it is expected, will encourage greater efforts in on-site recovery and reuse as well as general waste reduction.[85] The Ontario Waste Management Corporation will also consider the effect of pricing changes when its waste treatment site is selected.

The Ontario Blueprint, published to promote discussion and development of sound waste management policies, has proposed that a fee be levied at land disposal sites as a means of providing further funding for increased activity. The fee proposed in the Blueprint, based on per ton waste quantity, would be approximately $1. The funds raised in this manner would support a broad range of services to encourage reuse, recycling, reduction and recovery, and might include the capital and operating costs of the recycling activities, grant rebates, research and education projects.[86] There is no factual or analytical basis to the $1 surcharge fee.[87] It is estimated that at that rate approximately seven million dollars per year in revenues would be received.[88]

8.5. United States Response

Different methods for levying higher fees have been used in over 20 states in the United States.[89] These include:

(a) Eighteen states have charged a fee facility permit application which range from several dollars to several thousand dollars depending on the type and size of the facility. Twelve of the 18 states implementing a fee also charge an annual permit and/or an operating fee which is typically based on a percentage of the application fee. Both application and renewal are designed to at least partially reimburse the state for the cost of providing services during the permit review, inspection or construction approval processes.

(b) Annual fees for on-site facilities, off-site generator-owned facilities, off-site commercial facilities based on size of the facility, the type of waste management practice used, and whether the facility is on-site or off-site.

(c) Tipping fees usually collected by the facility "as a trustee of the state" and transferred to the state environmental protection agency.

(d) Transporters of hazardous wastes are charged fees by 14 of 20 states with fee systems and this is usually based on the number of vehicles used to transport hazardous waste. These revenues have been used to pay for spill response programs and to reduce the cost of permitting waste transporters.

(e) Taxation on hazardous waste generation equal to two percent of the gross charges and fees charged the Generator at the landfill site.

(f) Surcharges on owners and operators of hazardous waste sites which may (for example in Illinois) or may not (for example in Indiana) be deposited in a fund to support research and development alternatives to disposal.[90] Different factors are considered in determining what amount should be paid, if any, and who should be under an obligation to pay. For example, Florida exempts waste generators who treat their wastes to render it non-hazardous. In this case generators are exempt from the four percent excise tax levied at four percent of the price of disposal, storage and treatment of hazardous wastes. Kansas and Tennessee both have established a schedule of fees based on the degree of hazard and cost treatment of disposal. This allows the state to discourage hazardous waste disposal by scheduling high fees. On-site treatment and disposal is often dealt with more leniently than off-site, though representatives of the National Waste Management Association have stated that this discrepancy in fee structure is inequitable[91] because similar environmental and safety considerations apply in either case.

Appendix F shows United States hazardous waste management program fees in chart form.

8.6. Conclusions

There are numerous options available to encourage the use of technologies minimizing waste through raising the price of landfill. There is general consensus that the price of landfilling should reflect the true cost but disagreement on the methods of making that happen. Representatives of the waste management industry do not advocate use of artificial financial incentives to raise the cost. They state that as waste management regulations become more stringent, the cost of landfilling will naturally rise. This view is shared by the Ontario Municipal Association and several municipalities in Ontario. One municipality has taken an opposite view, conditionally endorsing a fee system if money levied is kept within the municipality and directed to its own reduction and recycling activities.[92]

In responding to the Ontario Blueprint, one representative of the Ontario Waste Management Association (OWMA) describes a surcharge as "overkill" stating that, "requiring disposal facilities to pay a tax going to recyclers would be requiring some facilities to subsidize their competition."[93] The OWMA suggests that if the province needs money to encourage recycling and reduction it should levy $1 from each taxpayer in Ontario to do so. Other arguments have been raised against user fees. The cost of landfilling might become so high that waste generators will consider disposing of their waste illegally through midnight dumping or other techniques. The fee could drive both generators and waste management firms to jurisdictions that do not have fees, it is contended. Furthermore, there may be difficulty in enforcing user fee legislation as many states in the United States have run into collection problems.

The surcharge concept appears to be a most useful short term tool to encourage waste reduction and recycling. To contend that the direct surcharge raising the cost of landfill could become so prohibitive as to force waste generators or waste management firms to use illegal means seems unreasonable. This argument can be directed to any proposed environmental guideline or regulation developed to promote public health and environmental safety because methods of disposal will become more difficult and the costs of safe disposal will become more prohibitive.

A surcharge, as suggested here, would provide a fund to develop alternatives to traditional waste disposal, assist in educating waste generators on means of minimizing waste and saving money, and in reducing the risks of hazardous waste disposal. The fee, like any other standard or environmental requirement, will not be prohibitive if options are available to generators to decrease waste quantities. The suggestion that taxpayers pay the $1 surcharge tax seems inequitable. Up to this time the cost of landfilling has been subsidized out of the public purse. Furthermore, it will be the individual taxpayers who pay the cost of the surcharge down the line through purchasing practices. Also the surcharge used for recycling options should not be viewed as subsidizing competition. It is a means of reducing waste by rechannelling wastestreams to more productive areas and in the long run could keep the prices of waste disposal down by lessening the demand on land and services.

While work is being done to evaluate the true cost of landfilling, most investigation focuses on what are known as internal costs, not social costs.[94] In any event an assessment of the true costs, both internal and social, of landfilling and waste treatment generally, would appear to be primarily retrospective and not quantifiable at some level. A user fee or surcharge, reflecting an amount closer to the true cost, could provide a necessary deterrent to waste generators' needless land disposal. Furthermore, a surcharge directed at the disposal site reaches all firms associated with the generation of wastes and will go from the disposal site operator to transporter to waste generator and to the public in the form of higher costs of goods.

8.7. Recommendations

It is recommended that Environment Canada:

(a) **match on a percentage basis (between 25 - 75%) provincial revenues from fees with proportionate federal money to assist in regional reduction and recycling programs;**

(b) **develop an indepth study of the advantages and disadvantages of various methods of raising costs through surcharge/taxation/amounts per ton;**

(c) **use the manifest system to readily identify wastes that can be recycled; and**

(d) **investigate with the provinces a variance in surcharges or other levies according to various factors (potential reuse of materials, danger, etc.).**

It is recommended that provincial environment ministries

(a) **implement application fee and permit fee for landfill use;**

(b) **implement an additional fee or surchage per ton of waste for waste disposal;**
The additional fee should be calculated to be commensurate with the true cost of landfill as a bare minimum, and should include but not be limited to the following criteria:

(a) administrative costs of disposal sites,
(b) costs of public hearings,
(c) environmental costs,
(d) loss of land use,
(e) resource reuse loss, or
(f) health maintenance.

The estimated surcharge should be channelled into programs that encourage at source reduction or recycling in the industrial sector (further surcharges will be necessary for administration of a superfund and perpetual care).

The Ontario Ministry of Environment Blueprint recommended that a $1.00 surcharge be levied on each ton of waste landfilled and then channelled into resource recovery programs. This estimate was not based on specific criteria but on how much money could be raised to support recycling programs. With a $1.00 surcharge, approximately $7 million would be raised each year. Although it is important to consider the amount of money that will be raised, further investigation of specific criteria noted above should also be evaluated in order to bring the cost of disposal and treatment up to the true cost.

It is recommended that a surcharge be implemented in the very near future. In order to do this quickly, it may only be possible to adopt a ballpark figure, as in the Ontario Blueprint, based initially on the amount that could be raised. It is submitted that the figure should be higher than the $1.00 recommended in the Blueprint.

Money levied through a surcharge could be used to assist industries in implementing low waste technology. The rise in the cost of waste disposal would also motivate waste generators to investigate alternative, lower costing and cleaner methods of waste management.

(c) **work with the federal government in developing a study of the advantages and disadvantages of various methods of raising costs through surcharges, taxation, a fee per ton, etc., while applying a standard increase in cost per ton;**

(d) **work with the federal government in identifying wastes that can be recycled through the use of the manifest system;** and

(e) **investigate with the federal government a variance in fees according to various factors.**

9. POLLUTION CONTROL STANDARDS

9.1. Introduction

Pollution standards are set to control the concentration of contaminants entering the environment. Environmental standards are directed to the 'end of the pipe' of the industrial process or point source and are termed as emission standards (for air pollution) and effluent standards (for waste water). In most Canadian jurisdictions standards are set on a case by case basis. Effluent and emission standards can affect recycling and reduction activities. Companies may turn to low waste technology as they are obliged to modify equipment and processes to meet stricter environmental safety standards. With time, it becomes more difficult to manage end of pipe controls through constant retrofit. Emission or effluent standards can create the external stimulus needed to motivate industries to shift to low waste pollution technology which is more cost effective than conventional abatement solutions. The use of pretreatment standards as a complement to control standards in the United States has strengthened environmental standards and also appears to have assisted in encouraging recycling and reduction technology.

9.2. Meeting Pollution Control Standards and the Shift to Reduction and Recycling Technology

Canadian effluent and emission standards or guidelines are set out under the authority of several statutes including The Fisheries Act, The Clean Air Act and under provincial legislation such as the Ontario Environmental Protection Act, the Ontario Water Resources Act, the Alberta Clean Air Act and Clean Water Act.

Most standards now set are met through traditional controls and not through preventative approaches. Conventional pollution equipment can be quite costly but may still be preferred to recycling or reduction equipment because more tax incentives are available for its purchase. There are several advantages to recycling and reduction technology being implemented. It can meet environmental standards without a constant need for retrofit, proves to be very cost effective, and increases process efficiency.

Some of the hidden costs of conventional abatement equipment are:

(a) high cost of retrofit, i.e. adding or fitting onto a plant that is constructed with a low degree of pollution control;
(b) high cost of unforeseen borrowing (to meet stricter standards);
(c) inflated cost of equipment bought under conditions of expanded demand;
(d) high costs of delays in installing equipment; and
(e) lost production associated with delay.[95]

In fact, these hidden costs, the anomalies of conventional pollution control technology, stricter standards for emissions and effluents, and growing awareness of the social and environmental costs of pollution have led some industries to invest in comprehensive pollution prevention systems. There has been a significant trend in the United States and recently in Canada to invest in product processes that reduce pollution through recycling, and reuse.[96] These investments have led not only to comparative cost advantages within industry but have also internalized the external or societal costs of pollution.

For example, the 3M Company began its pollution prevention pays program nine years ago. Efforts there resulted in a reduction of air pollutants by 75,000 tons, water pollutants by 1,325 tons, waste water by 500,000,000 gallons and by 2,900 tons of sludge per year. Total savings that resulted from improved low pollution products, modified processes and reduced investment in traditional pollution control equipment due to pollution avoidance were approximately $97 million dollars over six years.[97]

Dow Chemical in Canada, in conjunction with a consulting firm, Diversey, devised methods to reuse steel maker's dust ten years ago. The two companies now recycle and eliminate landfilling of more than 10,000,000 pounds of steel maker's dust annually. Monsanto Chemical Intermediates, a subsidiary of Monsanto Chemical, now markets millions of tons of wastepaper by-products resulting from its paper company's chemical synthesis process, representing a potential market of $350 million.[98]

A resins manufacturing plant, under pressure by local sewage treatment plants to restrict incoming contamination levels, led the plant operator to investigate procedural changes in the plant so that waste water volumes were lowered, sludge generation reduced and sewage plant effluent kept within new guidelines. This was done without significant capital or operating expenses.[99]

A comprehensive survey of clean technologies operating in France has found that clean technology achieves the same desired result as conventional pollution control processes in 70 percent of the companies investigated and that in 69 percent of these cases the operations were less costly.[100]

All these examples[101] demonstrate that at some level, economic gain was a concern in promoting better waste reduction practices but that stricter pollution control standards and their consistent enforcement acted as an institutional push in promoting pollution prevention measures as long term solutions to compliance.

Although some of the companies still generate wastes requiring conventional treatment, they have been able to minimize some streams through innovative techniques. The response to stricter pollution standards is important.

Industries have been able to respond to stricter regulatory measures with flexibility and in many cases, cost savings through adopting preventative waste management strategies.

9.3. Problems with Present Controls

There are three general problems with pollution control standards as they now exist. First, in Canada, many pollution control standards are negotiated on an ad hoc or case by case basis. With very few exceptions, (one exception is The Federal Fisheries Act), there are no effluent standards for contaminants that are fixed by statute or regulations. Standards are often set on an ad hoc basis and are not enforceable until an agreement is struck with the polluter in question. This makes it difficult for an industrialist to estimate what will be the required standard for the company now and later, as the process could be subject to different standards once the agreement expires. It further engenders inconsistency as to how guidelines are met by different companies and from one year to the next. Second, recommended guidelines vary from one jurisdiction to the next. Third, environmental standards recommended under environmental protection legislation have often been attacked as being poorly enforced, and difficult and costly to enforce.

Generally, environmental enforcement agencies rely on voluntary compliance, moral suasion and prosecutions to enforce the objectives of environmental legislation. A recent study prepared for the Ontario government found that for many companies polluting may be more profitable than compliance.[102] The consultants preparing the study state that, "the actual value of legal fees and fines to a firm may be very low because a polluting company has a relatively small chance of getting caught, being prosecuted, being convicted, and if convicted, sentenced with a large fine."[103] The study recommends disincentives such as emission charges, financial penalties for missing compliance deadlines or surety bonds to complement present requirements under environmental legislation.

It has been suggested elsewhere, as well, that enforcement could be facilitated through pollution charges on firms. In this way, industries might be motivated to reduce pollution without the cost of direct regulation.[104] Some economists argue that in this way industry will absorb the external costs of pollution.

This suggestion is undesirable for many reasons. It essentially condones industrial pollution. It has also been argued by industry that this pollution charge is punitive in nature[105] and increases adversary relations between industry and government. Most important, the problem with the surcharge system is that, unless charges are not uniform from industry to industry, there is no motivation for any firm to internalize its costs of pollution as an incentive exists for other industries to take a "free ride." In other words a charge system can discourage reduction and recycling practices as the an industry that does modify its practices will still have to pay pollution charges for industrial pollution generated by other industries.

Although pollution guidelines that are set do not provide the most efficient means of responding to pollution problems, they do serve an essential regulatory purpose at this time. In the foreseeable future, they will have a role to play in environmental management. As noted earlier, there are many instances when a company has decided to shift to low waste production processes to meet higher pollution standards.

National standards could provide an important means of improving environmental management. If minimum effluent and emission standards were fixed by statute or regulation and were consistent throughout Canada, there could be a swifter and greater shift to low waste technology. The problems associated with inconsistent standards from province to province have been addressed elsewhere with regard to waste management practices.[106] National standards could provide an important means of improving environmental management. Constitutional issues associated with creating such standards are beyond the scope of this paper.

Higher fines and more consistent enforcement would also encourage better compliance and a shift to reduction or recycling technology. Greater knowledge by enforcement officers of low waste alternatives and their financial benefits would assist in negotiating control orders with companies. Another possible method of complementing present legislation and encouraging preventative waste technology at the same time would be the expanded use of pretreatment standards discussed below.

9.4. Pretreatment Standards

(a) Introduction

Conventional pollution control is not the most efficient long term regulatory response to reducing environmental pollution. In conjunction with regular controls, some American states have begun to implement pretreatment standards. Through treatment on the plant premises, hazardous wastes can be detoxified to promote safety and efficiency at the time of its disposal. The application of pretreatment measures to contaminated waste can save land space for disposal (through dewatering techniques), reduce ground water pollution (through detoxification), and promote resource recovery (through detoxification and reuse).[107]

(b) Pretreatment Methods

There are a variety of biological, chemical and physical methods of pretreating wastes. Biodegradation of organic wastes, used primarily with refinery or petroleum wastes, is a form of biological pretreatment. Chemical and physical pretreatment methods often contribute to resource recovery potential. Chemical pretreatment is designed to detoxify or reduce hazardous waste streams. Examples of chemical pretreatment include solvent extraction, neutralization and wet air oxidation. Physical pretreatment methods isolate constituents of waste for recycling, or reduce the volume of waste. Examples include dewatering techniques, steam stripping of volatile components, and stabilization and fixation.

The area of pretreatment is relatively recent, and needs more research into its role in waste management.[108] Municipal sewerage bylaws in Ontario, for example, have developed pretreatment standards for different waste streams discharged into a municipal sewer. These standards do not cover every category of industrial user and may be open to inconsistent application and enforcement from municipality to municipality.

In the United States, national pretreatment regulations have been developed. These include categories of standards for discharge units for different industrial users and more general pretreatment standards. The effect of pre-treatment standards on recovery processes appears positive. For example one company, anticipating that pretreatment standards were to be implemented, decided to integrate advanced pretreatment technologies into its metal finishing company. These processes now recover metals and reduce the amount of water needed in the plant process.[109]

The development of detailed standards of waste stream treatment prior to discharge could strengthen present pollution control standards. It could also assist in the reduction of waste toxicity, and encourage the investigation of pretreatment technology that would allow reuse of waste. The area of pretreatment standards needs to be examined further and American regulations in this regard should be followed. Pretreatment is raised here briefly because it presents one possible option for strengthening environmental controls and further promoting resource recovery.

9.5. Other Incentives Necessary

Stricter environmental controls can motivate waste minimization in large industrial processes. A shift to low waste practices will not necessarily be the result for small industries with less capital unless other incentives or programs are available. It has been contended, for example, that stricter pollution control standards may only lead to more waste being produced internally. Companies may still choose conventional equipment to meet new standards of performance as financial incentives encourage investment in conventional pollution control equipment and more information is available on conventional technology.[110] If more financial incentives were available to invest in recycling and reduction equipment, and if more information was available on the long term benefits of a clean technology program, this would not necessarily be the result.

Accessibility of information on reducting waste in various industries is a very important consideration. These factors, with stricter pollution controls, not only at the end of the pipe but also in the pretreatment stage for waste would assist industries in carefully considering their options before renovating old control equipment to meet more demanding standards.

9.6. Conclusions

An extensive review of pollution control standards is beyond the scope of this paper. The parameters of this study do not permit a detailed examination of conventional pollution control technology. Strict and well enforced standards are discussed here to show how they affect preventative practices in pollution control. Their implementation and use are one of many factors affecting the way industry and government view recycling and reduction.

Stricter controls will not always motivate industries to innovate their processes to minimize waste. Other incentives are necessary. For example, environmental enforcement officers could provide information regarding process innovations in negotiating controls with industry. This is one way that pollution control enforcement might become a more co-operative effort between government and industry.[111]

9.7. Recommendations

It is recommended that Environment Canada

(a) **Conduct information sharing programs on recycling and reduction technology for federal environmental enforcement officers to provide this information to industries in the process of setting control orders.**

(b) **Study the means available to develop consistent standards for pollution control.**

(c) **Conduct and assist research on pretreatment methods and on developing pretreatment standards.**

It is recommended that provincial governments

(a) **Conduct information sharing programs on recycling and reduction technology for enforcement officers to provide this information to industries in the process of setting control orders.**

(b) Investigate legally enforceable minimum effluent standards.

(c) develop, with the municipalities, broader categorization and uniformity of sewerage bylaws to cover greater numbers of industrial users.

10. LACK OF LEGISLATION

10.1 Introduction

The lack of comprehensive legislation promoting recycling and reduction activities is a barrier to industry meeting its potential in this area. Legislation integrating recycling and reduction activities within environmental management policies can serve several important purposes. It can act as official recognition of the necessity of recycling and reduction as part of any waste management and environmental protection strategy. It can create a mandate for government agencies to administer a waste reduction policy. Legislation can increase awareness in all industrial sectors of recycling potentials and assist in co-ordinating individual efforts in this area. It can also provide numerous incentives and disincentives to quicken the shift in attitudes and economic conditions to favour recycling and reduction activities. Finally and most important, legislation can serve to develop and support long term goals of environmental protection such as resource conservation, environmental and health safety, and economic self-sufficiency. While provincial and federal governments have been developing policies in the area of recycling and reduction, legislation has not been passed to encourage these activities.

10.2. The Need for Legislation Related to Reduction and Recycling Activities in the Industrial Sector

The focus of most waste management policy in Canada is on conventional disposal. The recognition given to recycling and reduction potential through law and policy is still fairly passive. Rather than recognizing the role of these activities in reducing problems of conventional waste generation and management, the emphasis has remained on site selection for landfilling wastes. It is assumed that recycling and reduction will naturally come to play a greater role as economic conditions change.[112]

Future requirements of waste management may demand landfilling. Nevertheless,it is disappointing that more stated Canadian government policy does not recognize the potential of recycling and reduction as a long term solution to waste management. For example, no comprehensive scheme is proposed in the Ontario Blueprint to encourage recycling and reduction although recycling, reduction, recovery, and reuse have been identified as the challenge for industry to "bringing new life in waste management in the province."[113] Added legislation providing a structure in which government could actively encourage resource recovery could assist in making recycling and reduction a more active component of waste management today.

There are four identifiable areas where legislation could alleviate some of the barriers to reduction and recycling use in industry today. These are:

(a) to provide a series of incentives and disincentives in existing legislation to encourage recycling and reduction;

(b) to create a mandate on an appointed body within federal and provincial governments to meet recycling and reduction objectives;

(c) to determine the degree to which an industry should be legally obligated to recycle wastes; and

(d) to develop protective provisions in various areas of law such as purity standards, confidentiality or liability, so that potential recyclers of waste will not be deterred by health, technical, environmental or legal difficulties and to avoid undermining standards of environmental quality in promoting waste reduction.

10.3. Legislative Incentives for Low Waste Technology

(a) Introduction

Some piecemeal incentives and disincentives have been either proposed or passed to promote recycling and reduction technology. Some of the methods that can be used to create incentives for low waste technology include the application of the manifest system to identify materials that can be recycled, definitional exclusions under statute, land burial restrictions and product standards.[114]

(b) Use of manifest system to categorize recyclable materials

The Federal Transportation of Dangerous Goods Act is being amended to include provisions for a manifest system to trace the travel of toxic substances. It would be useful to apply the system to identify the potential reuse and recycling properties of materials. The manifest system has been applied in some American recycling programs in this manner.[115] No plans are proposed by the federal government to use this system to categorize materials as to their potential recycling properties.

(c) Permit or definitional exclusions

This type of incentive usually involves the exclusion of certain projects from regular permit or other legal requirements. While this form of incentive could effectively encourage the use of recycling and reduction activities, its application must be carefully weighed against general principles of environmental protection and health.

The purpose of the policy to promote environmental quality could be undermined if the material or project excluded is unsafe. For example, waste-derived fuel is presently exempt from the hearing process of Part V of the Ontario Environmental Protection Act which deals with waste management. This exclusion is designed to encourage industries to use industrial waste as a fuel supplement by exempting these industries from the processes under the Act. The exemption applies to private industries incinerating waste on site. The exemption does not act as a real incentive to reduction or recycling as it deals with incineration-based waste projects. For example, it is true that burning plastic wastes as fuel saves energy. But plastic waste recycled into a fabricated product can double energy savings.[116] The exemption has been criticized because there is no environmental difference between a commercial company incinerating waste and an industry wishing to use waste as fuel on site. A private industry, exempt under this section, using waste as fuel could be subject to less supervision or investigation under waste management provisions of the Environment Protection Act than a company in the commercial business of incinerating hazardous wastes, even though both could be handling equally hazardous material.[117]

Exclusions can be effective but must be carefully weighed with potential health hazards and environmental problems associated with the project. Otherwise, the intent of the incentive is defeated. This form of incentive may be most useful when applied to protect reduction activities that might otherwise be subjected to unnecessary additional waste management requirements. For example, in Massachussetts it has been proposed that recycled materials be conditionally excluded from certain hazardous waste management regulations without associated risks in recent amendments under the Code of Massachusetts. The exemption would apply only where certain requirements are met. The generator of the hazardous wastes must notify the Department of Environmental Quality Engineering if the generator wishes to transfer the material to any person for its direct reuse. The material must be reusable with no more processing than the raw materials for which it is being substituted by the user. Once approval for its reuse is given by the department, the generator must notify the department of any planned change in the amount of or reuse of the waste and that department's written approval must be given prior to such change.

Massachussetts amendments also propose that treatments which are an integral part of the manufacturing process not be subject to licensing requirements, or other hazardous waste facility standards if the treatment unit is not primarily designed to recycle hazardous wastes and is directly connected to pipes from an industrial production process and totally enclosed to prevent spills, leaks or emissions of hazardous materials to the environment. Such a treatment facility would also be exempt if it is designed to reintroduce hazardous waste constituents into the industrial production process and is totally enclosed. This type of exemption would appear to address the concerns of industries reusing and recycling their wastes on site in closed loop processes.[118] It is difficult at this point to forecast their effect in meeting environmental standards. They do address the concerns industries might have about reusing and recycling their wastes on site if they had to meet the same requirements of the commercial hazardous waste facility (such as long term insurance and financial bonds). Very strict conditions for exclusion are imposed in order to ensure environmental safety.

(d) Land burial restrictions

This is really a disincentive to landfilling with the expected result of encouraging waste generators to investigate other means of handling wastes. Land burial restrictions might be comprised of a total ban on land burial for toxic wastes or the restricted use of land burial for certain types of waste. Another approach is to require the neutralization, detoxification, solidification, or encapsulation of wastes prior to land disposal. Quebec has prohibited land disposal of toxic wastes since 1978 and recently undertook the treatment of some toxic wastes not recycled or reused on site at Stablex, a waste solidification centre.[119] Several American states have taken a similar approach. Other jurisdictions, such as California, have prevented the use of land filling where it is technically feasible and economically reasonable to require that the waste be treated or recycled.[120]

As with permit exclusions, it is important to identify, prior to the use of this disincentive, scenarios that are not to be encouraged so that they are not advanced. For example, Quebec has prohibited land disposal of toxic wastes but it is now advancing the use of waste solidification and incineration to dispose of wastes that are not recycled or reused on site in Quebec. Neither of these technologies truly promote waste reduction and recycling and may detract from low waste options.

(e) Consumer product standards

To date, consumer product and manufacturing legislation has not developed standards considering the longevity or durability of the goods or the degree of non-waste technology comprised in a manufactured product.

Product standards are often based on technical considerations above all. Durability and longevity standards for products could be developed in setting technical standards for products. They could have the added effect of promoting reduction activities in industry. Standards could also provide a means by which consumers could support low waste options through purchasing practices. For example, the Canadian Standards Association (CSA), a voluntary and self-regulated group, develops standards which are widely used by industry and commerce and are often adopted in regulations by municipal, provincial and federal governments, particularly in the health, safety and environmental fields. The CSA is made up of business, government, labour, consumer and other associations that voluntarily work toward developing national standards, using the consensus principle. The CSA welcomes any group with an interest in establishing standards, the right and responsibility to provide the technical knowledge, the ideas and experience for developing those standards.

At this time, there are no standards incorporating considerations of the principles of low waste technology or non-waste technology in industrial production processes. The development of standards with these considerations and other criteria such as longevity, durability, and reusable properties would be of assistance to industry, government and consumers alike in decision-making. Consumers especially would be in a better position to make an informed choice in their purchase practices. It is interesting to note that the Ontario Ministry of Environment recommends that government be more involved in developing standards based on reduction and recycling principles in the Blueprint for Waste Management.

(f) Conclusions

Some environmental laws and regulations in Canada implicitly recognize recycling and reduction. For example, environmental assessment legislation often considers "alternative technologies" in determining whether a project subject to an environmental impact assessment hearing should be approved. Social, economic and cultural considerations can be considered and arguably, there is room for consideration of recycling and reduction potentials under these headings when a proposal is subject to a hearing. Some environmental protection legislation gives the ministry authorization to issue control orders to limit the rate of discharge of a pollutant into the natural environment.[121] Enforcement orders could include conditions requiring the installation of recycling and reduction technology to limit emissions of a contaminant.

More explicit reference to low waste technology is needed both in environmental and other legislation in order for industry and the public to better appreciate its role in waste management. Careful consideration of the incentive's goals must be made prior to its implementation to ensure that it maintains support for reduction and recycling and environmental quality.

10.4. Creating a Structured Mandate Within Government to Promote Recycling and Reduction

(a) Introduction

Several ministries have a stated objective of encouraging recycling and reduction. Legislation can designate a body to carry out this mandate and provide incentives or disincentives to assist in meeting the objective and making recycling and reduction a recognized, important component of waste management.

(b) Mandate in Canada

Environment Canada has a stated objective to encourage the recycling and recovery of waste materials. Provincial governments or crown corporations, such as the Ontario Waste Management Corporation, include as part of their mandate investigation into recycling and reduction activities. To date, there is no legislative plan proposed that would provide specific guidelines about encouraging the application of waste minimizing activities in industry.

(c) U.S. mandate

The Resource Conservation and Recovery Act (RCRA), a federal statute, was enacted in 1976 to encourage the development of technology for retrieving and reusing waste material. The Act establishes an inter-agency cabinet level Resource Conservation Committee which is required to analyze and devise recommendations on a wide range of conservation policies. Some of its duties include: recommending incentives to enhance resource conservation; examining the impact of existing policies in resource recovery; investigating the feasibility of restricting the manufacture and use of certain categories of consumer products to promote conservation; examining the feasibility of solid waste management charges on consumer goods which would reflect the cost of solid waste management services and the value of recoverable components as well as the social value associated with not recycling products.

The Resource Conservation and Recovery Act regulates hazardous wastes in each state until they develop their own program which must be approved by the federal Environmental Protection Agency. If the state program meets federal standards it is eligible for federal assistance. Because the RCRA has a committee devoted to resource recovery activities there is a mandate to promote recycling and reduction, although the scope of research and investigation seems fairly limited. The effect that this statute could have on initiating recycling and reduction has been hampered by funding cutbacks under the United States Environmental Protection Agency which administers the Act, the exemption of small waste generators defined as generating less than 1,000 kg waste per month, and the exemption of wastes burned in heating oil. In 1982 up to 90percent of waste handlers qualified for the small generator exemption. Consequently, nine billion pounds of waste were exempt from the requirement of the Act.[122]

CALIFORNIA

In 1981 California implemented regulations under its Health and Safety Code which were referred to by then-Governor Jerry Brown as "long term health insurance."[123] The initial program called on the California Department of Health to encourage recycling and reduction activities in several ways. The program called for a phase-out of land disposal and prohibited disposal of hazardous wastes including cyanides, toxic metals, strong acids, PCBs and other wastes currently classified as "extremely hazardous".[124] The Department also had to ensure that recycling and treatment alternatives be available at least 45 days prior to the effective date of land disposal restriction. It was under an obligation to revise the land disposal restriction schedule if treatment and recycling alternatives were not available and to exempt low hazard materials from the restrictions.

Unlike the federal RCRA the California regulation did not exempt small businesses from the application of the program. Their decision to do this was based on a fiscal study of six representatives from small businesses. The Department of Health Services in California found operating costs of small businesses would increase only about one percent a year or less except in the agricultural and chemical sectors.[125] The California program has gone through changes since its inception but the focus is still on minimizing hazardous wastes.

(i) Materials that can be recycled under California law

Materials that can be recycled would be considered a hazardous waste but for the fact that

(1) some use or reuse of the material may be intended and can be demonstrated, and
(2) the material is a spent contaminant or used material or a process effluent or residue which has been transferred by the producer of the material to an unrelated or unaffiliated person for recycling or subsequent sale.[126]

The California department must prepare and adopt a list of hazardous wastes which are economically and technologically feasible to recycle. Each substance is categorized according to the degree and the kind of difficulty encountered in recycling. The department can request an industry not dispose of materials under this list.

The Department's duties and mandates are based on findings that numerous opportunities exist to reduce the amount of hazardous waste generated in the state and to conserve resources by applying existing resource reduction and recycling technology. The commitment of California is clearly spelled out in its legislation which states that it is in the public interest to establish regulations and incentives that ensure hazardous waste generators employ technology and management practices for their safe handling, treatment, recycling and destruction prior to disposal.[127]

NEW YORK

In New York, the Environmental Facilities Corporation has developed several tasks prescribed by the State Industrial Materials Recycling Act. These include the development of a waste exchange, a technical reference library, a technical assistance service, industrial financing options, the establishment of procedures on confidentiality, conducting a survey of small generators to determine their needs in hazardous waste management, and the development of a technical assistance consultant program.[128]

(d) Conclusions

Both California and New York have articulated clear policy objectives for encouraging waste minimizing activities and identifying which are immediately essential. Legislation in both states has served as an impetus for information programs for industry and the public to promote the importance of supporting waste recycling and reduction. Legislation has also recognized that greater opportunities exist for recycling and reduction and that further implementation depends on concerted coordinated action by government and industry.

10.5. Creating an Onus on Industry to Recycle

(a) Canada

There is no legal onus on industry in Canada today to engage in source reduction or recycling activities.

(b) U.S.

The situation is somewhat different in California where there is a limited mandate for industry to recycle wastes that have been identified as able to be recycled.

Concerns with creating an onus in this area would include enforceability and the costs connected with enforcement. The present provisions under the California Health and Safety Code require the department to prepare a list of hazardous wastes which are economically and technologically feasible to recycle. When a waste on that list is disposed of by a generator, the Department may request that a producer or disposer of that waste supply the Department with a statement justifying why the waste was not recycled. If the Department finds that recycling of the hazardous waste was economically and technologically feasible at the site of production or if the department can provide the names of ready, willing and able purchasers of the waste, the disposer shall recycle that hazardous waste by either of the prescribed methods. If the disposer or generator does not comply with the order to recycle, then the Director of the Department can establish fees for the disposal of these hazardous wastes in amounts up to twice the base fee paid under the annual fee schedule.[129]

The rate of success in applying this provision has increased substantially over the last year. Appendix G shows the successful responses to California Department of Health Services inquiries sent during 1982 to waste producers. The provision is enforceable because it requires the Department to evaluate what technologies are available for recycling the waste under the hazardous waste list. Industries are presented with reasonable alternatives to disposal where possible. The provision does not appear to be costly to enforce. Under California law economic impact studies are required for different legislation to determine whether it is economically worthwhile to enforce the regulation in question. Existing legislation under the Health and Safety Code and the regulation under review have not been subjected to a complete analysis because the fiscal impact was determined to be negligible.[130]

(c) Conclusions

A mandate to recycle wastes seems possible where

(i) the technology is in place,
(ii) information is available to government and industry to make the requirement to recycle feasible and reasonable, and
(iii) industry is given sufficient lead time to integrate reduction and recycling into their processes.

A system similar to that in California could be developed in Canada provided that the system has categorization for materials that can be recycled. The California system provides for a cooperative approach on the part of industry and government to expand reduction and recycling opportunities.[131]

10.6 To Develop Protective Provisions

(a) Purity standards

Problems with the purity of the recycled material have occurred either because material is contaminated with toxic waste or because it is unsuitable for utilization in the production process. This factor may inhibit some companies from making more use of recycling wastes off site. The Canadian Waste Materials Exchange, an information clearinghouse for prospective buyers and sellers of waste, estimates that about one half of unsuccessful exchanges are due to technical problems. These include problems with the quality of the waste listed. For example, for plastics recycling there are over 300 resin types and they are not presently compatible with each other for recycling.[132] In 1981 an Environment Canada report found levels of PCBs (polychlorinated biphenols) in parts per trillion in recycled materials.[133] PCB concentrations were found in materials in waste while recycling in the steel and the paper manufacturing industries. It has been suggested that off site vendors be required to provide the industry buying the waste with either a certificate of insurance, or a contract protecting the company's rights.[134] This would be the preferable approach to dealing with the problem of purity standards as such requirements will be industry specific. Industrial associations and government agencies could work toward promoting this concept. Furthermore, research needs to be done to find uses for some waste streams that are now not reused or recycled.

(b) Trade secrets and confidentiality

The concept of trade secrets and proprietary information is a growing issue in Canada and the United States. It is difficult to assess to what degree this issue inhibits recycling and reduction activity. The manifest system will demand more specific information regarding wastes in any event. Also, the value of information in the waste may be questionable because its ultimate destination is disposal, if it is not recycled. The Canadian Waste Materials Exchange has a coding device to ensure that the publication of wastes offered by the original waste generator does not identify the generator. A company will only be identified if express requests to not use the coding procedure are made. Many American waste exchanges have similar coding devices. California and New York state both play active roles in initiating exchanges of industrial wastes, and there are specific provisions to ensure the confidentiality of the parties in question. Confidentiality is enforced under environmental laws in California and New York states through heavy fines for employees or government officers disclosing information, and through stated consideration in the law of the importance of maintaining confidentiality of trade secrets when government is assisting an industry investigating alternative methods of waste disposal. It would be important to initiate similar provisions in any legislation designed to encourage industries to work with government to reuse waste on site or to recycle wastes off site.

(c) Liability

Some legal parameters could be drawn in the area of liability. For example, where a waste is recycled off site to another manufacturer and is contaminated, would the buyer have recourse against the seller of the waste? If the body initiating the exchange is a waste materials exchange, either government or independently controlled, what responsibility or liability does that exchange have? These are issues that have not been dealt with in legislation and that are worthy of further research and discussion.

10.7 Conclusions

A legislative program would be helpful in promoting waste reduction and recycling. Many of the incentives applied in the U.S. and initiated in some Canadian jurisdictions, such as landfill phase-out, categorization of materials for their potential resuse or recycling properties and technical assistance programs, are feasible and applicable here. The important issue to be addressed through a comprehensive program is coordination. There is a real need to have a body specifically responsible for coordination of:

(a) priorities to be given to land disposal alternatives,
(b) categorization of materials that can be recycled,
(c) phasing out schedule for land disposal,
(d) educational and technical assistance on low waste technology (see section 11),
(e) directing further legal and technical research, and
(f) delegating a department to conduct a recycling and reduction program.

10.8 Recommendations

It is recommended that Environment Canada

(a) **appoint a special coordinating or steering committee with representatives from industry, government and public interest groups to:**
(i) **develop a comprehensive assessment of low waste technology use and potential in Canada, and**
(ii) **provide concrete means of implementing the technology in a two year span.**

(b) **develop the manifest system devised under the federal** Transportation Of Dangerous Goods Act **in order to identify and categorize wastes that can be recycled to enable industry to recycle such wastes where technologically and economically feasible.**

(c) **Develop guidelines to encourage industrial waste recycling.**
A reasonable mandate for industry to recycle could be developed through applying the same principles as the provisions under the California legislation. These require the Department to investigate possible uses of waste which would otherwise be disposed by the industry, and propose that industry use materials that can be recycled, and impose a high fine only where the feasible alternatives proposed to the industrial waste generator are rejected.

(d) **Legislation should be developed allowing Environment Canada to**

(i) develop techniques for ensuring purity standards of recycled materials to enhance their use and to prevent contamination,
(ii) oversee the operation of a waste audit program (see section 11),
(iii) ensure that confidentiality procedures are in place to enable industries to make the best use of these programs without compromising proprietary information,
(iv) implement a public information program on recycling and reduction in industries; an information program for industry through the use of newsletters, seminars, round tables, etc., and an information program for environmental officers (see Section 11),
(v) conduct further research in the area of liability,
(vi) conduct research and development in the technology of recycling.

(e) Encourage representation in the Canadian Standards Association to formulate standards for manufactured products that consider factors such as the longevity of the product, the degree to which the product uses recycled material in its process, and other factors that relate to non waste or low waste production processes.

(f) Conduct a survey of non-environment legislation to determine areas where standards could be included to encourage low waste or non waste product processes.

It is also recommended that industry and industrial associations:

(a) Encourage the use of legal contracts to certify purity standards of waste and to encourage waste exchanges.
(b) Encourage representation in the Canadian Standards Association for the formulation of standards for manufactured products that consider factors such as the longevity of the product, the degree to which the product makes use of recycled material in its process, and other factors that relate to non waste or low waste production processes.

It is also recommended that provincial governments

(a) Develop legislative programs to promote low waste technology that meet as a minimum the federal government program requirements.

(b) Develop a list of materials that can be recycled through the use of manifest systems and waste inventories.

(c) Investigate a restricted ban on landfilling for hazardous wastes with the aim of phasing out landfilling for toxic wastes in a scheduled time period.

(d) Assist and cooperate with Environment Canada in developing directions for further legal and technological research.

11. LACK OF INFORMATION AND AWARENESS ON RECYCLING AND REDUCTION POTENTIALS

11.1 Introduction

In Canada, as in other jurisdictions, the dearth of information available on waste minimizing practices and potentials inhibits the development of reduction and recycling in industrial processes.[135] The lack of references, information programs and informational tools to promote alternatives in waste management affects decisions made by industry, government and consumers. Some American jursidictions have implemented information programs and information agencies of various types including general information programs, technical assistance programs, waste audit, and waste exchange programs. In Canada there are only a handful of informational tools to assist in expanding an awareness of recycling and reduction potentials of industrial waste.

11.2 The Information Barrier - Effects

(a) Industry

The lack of awareness of recycling and reduction potentials affects the types of decisions an industry will make in matters relating to its processes and pollution control. The areas where information is lacking are:

(i) the availability of reduction and recycling technology;

(ii) the short or long term financial benefits that can be incurred through implementing even minor changes in processes to reduce waste;[136]

(iii) the necessity and importance of implementing waste minimizing technologies to deter environmental degradation and adverse health effects;

(iv) the potential and actual uses of waste materials as co-products in other industries, i.e. a lack of exchange mechanisms in the industrial sector to barter or trade waste or lack of knowledge on their effect;

(v) financial incentives or grants that may be available to them to assist in implementing lower or non waste equipment; and

(vi) the toxicity of some of the materials being used.[137]

The unavailability of information on recycling and reduction technology is a particularly acute problem for small companies. Smaller industries generally lack the finances to support technical efforts or to maintain staff to remain current on the most recent low and non-polluting technologies. Smaller industries lack the capital to make investments to renovate or fully modernize their plants. They may therefore not be willing to consider alternative technologies though these may prove to be more affordable in the long run. Due to the lack of information available, smaller industries may opt for conventional pollution abatement equipment without fully considering the benefits of alternative technologies.

A further problem that many industries have in disseminating information on low or non-waste technology relates to the fact that many are in competition with one another. Competition can engender silence. If a company has developed an economical and efficient low or non-waste generating process, it may choose to maintain a leading edge in the market by safeguarding process related innovations.

(b) Government

Lack of information concerning recycling and reduction affects government decisions and policy planning by:

(i) detracting from government incentive programs for reduction and recycling, and
(ii) maintaining an emphasis on conventional pollution abatement technology, strategies, legislation and control.

For example, as noted above, a greater awareness of reduction and recycling potential in different industrial sectors could further assist government officers in the negotiation of enforcement orders.[138] Government officials also lack a coordinated network of information on industry-specific recycling and reduction technology. Finally, information unavailability deters government agencies in their efforts to develop recycling and reduction programs.

(c) Consumers

Consumers may support the principle of reduction and recycling in theory, but there are no means to enable consumer support of these principles through buying practices. Consumers are not readily able to identify goods based on the degree of reduction and recycling technology involved in their production. This is due, in part, to the lack of information about what is recycled and what can be recycled in the market.

The Ministry of Ontario Blueprint suggests that reconstituted or recycled goods or goods planned with waste reduction processes be given a "good seal of approval"[139] so that consumers can identify goods based on the concept of waste reduction and recycling. The Consumers Association of Canada has always strongly advocated activities allowing consumers to make an informed choice in their habits and this extends to a choice based on what has been recycled.[140] Taxation policies could assist consumers. The United States EPA has considered implementing an added tax for goods that were recyclable but that had not been recycled.[141]

(d) Informational Tools

There are three general tools that could assist in overcoming problems encountered due to lack of information or awareness. These are:
(i) general information programs for public, industry and government education and for providing technical, financial and general information on low waste technology;
(ii) waste audits; and
(iii) waste exchanges.

11.3 General Information Programs

(a) Canadian programs

There is at this time no general information program to encourage recycling and reduction in the industrial sector in Canada. At this time Environment Canada has no formal reduction and recycling information program on industrial waste recycling and reduction. It has however recently developed a National Recycling Symbol (shown in Appendix A) to expand public awareness of recycling and source reduction potentials. Environment Canada hopes the standard national recycling symbol will foster a greater commitment of industry to recycle wastes.[142]

Alberta and Quebec have initiated recycling programs for the industrial sector, but as yet no information programs appear to have been implemented. In Ontario, there are residential or commercial recycling programs, such as the Source Separation Program and the Centre for Resource Recovery, but there is no formal information program on industrial reduction and recycling.

In the Kitchener-Waterloo area of Ontario, a waste information centre has been set up as part of a demonstration project for industrial waste recycling. The project has been funded and conducted in part by Environment Canada, the Regional Municipality of Kitchener-Waterloo, and involves the participation of consultants and the Kitchener-Waterloo Chamber of Commerce. The waste information centre is one of a kind in Canada. It provides a free service to industries on the potential uses of their waste products and alternative methods of disposal. The project was one of a series of ongoing measures initiated in 1983 in the Kitchener/Waterloo area to help local industry to better manage wastes. Functions of the industrial waste management program centre are:

(i) To create an information centre within the region's engineering departments to provide technical and other assistance, as well as guidance to government agencies and other support that a company may need to improve its waste management practices.

(ii) To facilitate opportunities for local industries to buy and sell wastes.

(iii) To provide a history of reduction, reuse, and recycling success stories.

(iv) To offer technical information through seminars or other means.

(v) To provide specific practical information as to the methods the company can adopt to economically manage wastes.

The project also runs a waste exchange as a branch of the Canadian Waste Materials Exchange (to be discussed below). It has also recently completed six manuals on waste reduction opportunities in six industrial sectors. The information centre has only been in effect for about one year and it is difficult to judge its impact to date. Benefits of the project listed at its inception include:

(i) increased profits
(ii) higher community standing
(iii) competitive edge in the market
(iv) increased environmental health.[143]

There are other research-oriented technical programs that do provide assistance and share information with industry and governmnent on various technologies available. These include the Canadian Institute for Scientific and Technical Information, National Research Council, and the Waste Water Technology Centre. Part of the work of the above institutes touches on recycling and reduction but their mandates are broad and only infrequently deal with information dissemination in low waste technology.[144]

(c) American Information Programs

New York and California have both implemented comprehensive legislation to encourage industrial waste recycling and reduction. Information programs and tools such as a waste exchange, tehnical assistance, and waste audit programs form a large component of these programs.

In New York the Industrial Materials Recycling Program (IMRP)[145] is operated by law by the state Environmental Facilities Corporation. It provides a waste audit program to encourage the reduction, recovery and recycling of industrial materials that would otherwise require disposal.

The program fulfills several important educational roles and includes, but is not limited to, the following functions:
(i) Planning and compiling research and development information on industrial methods, technologies and practices resulting in reduction, recovery or recycling of industrial material.
(ii) Investigation and research into the market potential and feasibility for increased utilization of recovered or recycled industrial materials.
(iii) Collection, development and maintenance of data on production of industrial materials.
(iv) Reviewing existing methods, technologies and practices relating to the generation, use and disposal of industrial materials.
(v) Development and maintenance of the technical reference capability of industrial material reduction, etc., including information for public and private use.
(vi) Encouraging and assisting generators of industrial waste to help reduce, recover or recycle material.
(vii) Establishing and maintaining information clearinghouses for industrial waste.
(viii) Preparing and updating industrial material which the Corporation finds technically and economically feasibile to recycle and recover.
(ix) Preparing a handbook on recovery and recycling for use by industry.
(x) Coordinating with regions for the participation of all entities in the program.

The New York program is modelled after the California legislation which provides a similar information program. Items (i) to (v) and (viii) to (x) noted above, could provide general information systems to promote the application of low waste technology.

Appendix 1 of this report reproduces sample lists of industrial waste that have recycling and reduction potential. These lists have been developed as a first step in providing information on material recycling potential.

An interesting aspect of the IMRP is the technical assistance program, permitted under item 6 above. The information assistance program in New York has helped direct waste streams into more productive channels. For example, the technical assistance program identified and helped correct a rinse water disposal problem in metal machinery operation. Steel manufacturers with pickling liquor disposal problems have been provided with alternatives to those problems. Technical information about available acid purification systems process alternatives are being discussed with the dairy industry which is seeking relief from the high cost of pre-treatment sludge disposal.[146] The popularity of the program has increased since its inception two years ago.[147]

The New York program also provides waste stream analysis, source reduction information, and financing programs. A diagram of the nature of the technical assistance program is shown in Appendix J. The program has been run by part time technical staff for the field work involved in visiting industries. It has been recommended that better staffing and consulting assistance with more specific expertise be provided.[148] To date, it has been fairly successful in waste reduction and industry appears satisfied with the program.[149] Some industries were unwilling to approach program employees for assistance because of the possibility of being charged under environmental state legislation should standards be found to be below regulatory requirements. One suggestion that has been made to partially resolve this problem is establishing confidential procedures for staff of the Industrial Materials Reduction Program and the hiring of outside part-time technical staff field representatives on a consultant basis for field visits.

11.4 Waste Audits

(a) Introduction

Auditing involves the methodological examination and analysis of procedures, practices, and processes of a company to assess the ability of that company to meet its own goals and objectives as well as legal requirements. A waste audit is an investigation, either formal or informal, of the process of an industry to determine:

(i) the amount of waste generated in the industrial process;
(ii) the degree of hazardous components in the waste:
(iii) the cost of disposal; and
(iv) the methods by which these wastes can be decreased by identifying leaks or sources of material loss and thereby meet environmental objectives.

When the problem areas of industrial process are identified, a company is in a better position to evaluate its options for waste management and establish waste reduction goals. Some industries carry out waste audits through private associations.

A waste audit provides industry with information to determine the long and short term steps necessary to reduce waste. Environmental or waste audits are growing in popularity in the United States. They can assist companies in meeting stricter legal standards, cutting costs and reducing environmental headaches.

(b) Canadian or Provincial Waste Audit Programs

No formal waste audit programs exist in Canada or the provinces at this time. An industry can conduct private audits.

In 1978, the federal Ministry of Energy, Mines and Resources, in conjunction with provincial governments, instituted an energy audit program. The National Energy Audit Program (NEAP) is designed to help industry and commerce conserve energy and reduce operating costs. The NEAP program offers several services including

(i) On site preliminary energy audit through an ENERGY BUS visit. The team outlines steps which can be taken to promote energy efficiency.
(ii) Consulting assistance grant - the grant will subsidize up to 90 percent of the consultants' fee.
(iii) Seminars and workshops.

The program is administered, promoted and monitored by the provinces and operates in Quebec, Manitboa, Saskatchewan, British Columbia and the Martime Provinces.[150] The Energy Bus component of the program has resulted in energy savings of $140 million.[151]

A Waste Audit program is a useful tool for cutting down waste generation and can result in savings for a company. Financial incentives to encourage the voluntary use of audits were suggested in a previous section through the use of tax credits for voluntary audits. The concept could be further integrated into waste management practices. For example, the conduct of an audit could be imposed as a precondition to receiving an environmental control permit. An audit program similar to the Energy Audit Program could be implemented to provide technical assistance to small and medium sized businesses.

11.5 Waste Exchanges

(a) Introduction

An industrial waste exchange is best described as an informational tool[152] based on the concept that "one man's garbage is another man's gold."[153] An industrial waste exchange is a mechanism for connecting wastes or by-products with companies that can reuse or reprocess that waste. In the context of recycling, the imaginative reuse of wastes through exchanges can be an alternative to traditional disposal of wastes which cannot be reused or reduced internally. Waste exchanges have been in existence in Europe longer than in either the United States or Canada.[154] Waste transfer through a waste exchange can be accomplished in a number of ways:

(i) Passive information exchange. Information goes through a clearinghouse agency. Waste generators and buyers must contact the clearinghouse in confidence. The agency is responsible for having sellers recontacted by the interested buyer.

(ii) Active information exchanges. In this case the exchange takes an active role in matching users with generators, either through interviews, meetings, or computerized matches.

(iii) Broker assisted waste exchanges. These are active in nature and are privately operated. These are mainly private business motivated on a profit basis. Two parties deal with each other by a broker who transfers the waste from generator to buyer, usually on a commission basis.

(iv) Direct transfer between two industries is the final method of linking waste by-products with interested recyclers and reusers of that waste.

A diagram of the nature of passive and active waste exchanges is included in Appendix K. Whatever mechanism is used to effect a waste transfer the benefits of waste exchanges are threefold:[155]

(1) to save valuable resources,
(2) to save energy by not having to process raw materials, and
(3) avoid environmental damage by:
    (a) preserving raw materials and conserving energy; and
    (b) diverting a waste stream from land disposal or other higher waste treatment technologies.

A further important role that a waste materials exchange can play is educational. Exchanges can serve to educate industry and the public about resource conservation through the economic reuse of waste. This is especially so if the exchanges operate at a fairly high profile. A further educational function of such an exchange apparent in Europe where many waste exchanges have been in operation since the early seventies. There, some companies have made use of waste exchanges to offer wastes that are not yet generated while awaiting the construction of a new plant. In this way, the potential transferability of the waste can be forecast ahead of time at the planning stage and different processes can be explored to avoid the high cost of disposal until transferable wastes are found.[156]

(b) Canadian Waste Exchanges

The Canadian Waste Materials Exchange is the one waste material exchange operated in Canada. It is operated nationally. Branches are currently being arranged and have been established in the Kitchener/Waterloo region and in Alberta. The Canadian Waste Materials Exchange (CWME) is operated by the Ontario Research Foundation and is funded by Environment Canada and several provinces. The Exchange is operated in the passive format acting primarily as an information clearinghouse, linking waste owners to buyers. The CWME began in 1977 after publicizing its service to over 42,000 businesses. As with other passive waste exchanges the CWME experienced a rapid increase in inquiries in its first few years of operation. In the last two years the inquiry rate and the number of successful exchanges has had a consistent average of about 400 enquiries every two months and approximately 50 successful exchanges yearly. Over 5,000 companies or 12 percent of the companies initially solicited have participated in the exchange.

A minimal fee of $25. is required for membership and entitles a company to list its wastes in a bimonthly bulletin and receive the listing published of wastes. Confidentiality of the nature of wastes a particular company produces is ensured by coding the wastes listed in the waste materials exchange bulletin. Since its inception six years ago the CWME recorded over 292 successful exchanges or about 15 percent of its listings. The inquiry rate is 91 percent.

Reasons for the relatively low rate of non-transfer of materials vary. The major three problems identified for waste transferability are:
(i) technical problems of a quantitative nature, such as not enough waste or too much of the waste listed;
(ii) technical problems of a qualitative nature, for example, the contamination of the waste stream or inadequate purity of the material. These two problems account for 50 percent of the rejections on inquiries.
(iii) Other problems include geographic and economic considerations.[157]
Approximately 202,400 tons of waste are exchanged annually with an estimated replacement value of $5.91million per year.[158]

The performance of the CWME until now is exceptional, particularly in light of its financial and operational restraints. The waste exchange employs only one person half time per year and it operates as a passive exchange. Yet the replacement value of the total waste exchanged annually is estimated as $5 million. In the initial years of any waste exchange, particularly passive exchanges, there are many more matches made until connections are made between industries who exchange specific wastes. Successful rates of transfer then level off as industries exercise direct transfers through avenues initially established by the exchange. In 1980, it was estimated that only 2percent of liquid industrial waste generated in Ontario between 1979 and 1980 was recycled through the Canadian Waste Materials Exchange. This estimate could undoubtedly become higher. Better staffing for further research to overcome technical barriers to exchange and greater encouragement of the service and the overall savings the exchange can provide, could increase the proportion of waste exchanged.

(c) United States Exchange Programs

The New York Industrial Materials Recycling Act requires the establishment and maintenance of an information clearinghouse for recyclable and recoverable materials. The New York information clearinghouse is patterned after California's waste exchange where a mixture of the passive/active model is used. As noted above, the California system is somewhat more demanding because it requires that operators justify their choices of disposal over recycling of a waste stream that has been categorized as recyclable. A government official can redirect wastestreams that can be recycled but are not recycled to waste exchanges. At this time New York has no such requirement.

Both the New York and California exchanges operate on an advisory basis and they also function actively to initiate changes and find uses for waste materials. The California Department of Health has resources to provide free technical advice to potential waste trading partners. In New York, the Environmental Facilities Corporation has recently tried to locate ways to rechannel waste streams presently directed to secure land burial that could be recovered for reuse instead. Under both systems, state legislation has implemented a manifest system or a tracking system which has been used to provide a means to categorize wastes with reusable properties. Also, in both cases, there is substantial outreach with chemical and resource recovery firms to identify various waste streams and redirect them for reuse.

These exchanges have a broader mandate than the Canadian exchange and have more funding to support the search for uses of waste materials. The manifest system in these states is also used to provide a more reliable mechanism for identifying waste streams so that more preliminary work in categorizing reusable waste streams can be conducted.

Other states have also initiated waste exchanges or recommended legislation to study the establishment of state-wide exchange services.[159] In some cases where states have initiated waste exchanges, the operation of the service has eventually been transferred to private industry or to industry associations. Chemical exchanges and brokers of a private nature are also very common in the United States.

(d) European Exchanges

Waste exchanges began in the early seventies in many European countries. At this time, an efficient network of exchanges exists to promote effective waste management within each country and also cooperates with other countries operating within the system.[160] The operation of these exchanges is perceived as a valid and important form of recycling and waste management. Other benefits identified in Europe are potential savings of disposal, raw material savings, and lessening of the amount of production materials that would otherwise be a waste product.

Participation in waste exchanges in Europe is not mandatory, but in some cases the mandatory membership of each industry in the Chamber of Commerce enhances the use of exchanges considerably. Chambers of Commerce usually operate as a coordinating body for many waste exchanges and are subject to a high degree of government control. Canadian Chambers of Commerce act primarily as a private representative body for business interests. For example, in Germany, it is mandatory to be a member of the Chamber of Commerce and by becoming a member of the Chamber of Commerce, industries are connected to waste exchanges, not only within the region or country, but within other countries as well.

The most significant additional characteristic of waste exchanges in Europe is cross frontier networking. Cross boundary umbrella organizations exist through the Nordic waste exchange in Scandinavia and through the German National Chamber of Commerce. These waste exchanges network with other waste exchanges in Austria, Switzerland, Italy, Luxembourg, and France. Exchanges in the United States have begun to network from one region to the next. The Canadian Waste Materials Exchange has also executed several waste exchange listings with the United States. If the Canadian exchange continues to expand, as expected, it will no doubt consider networking as well. It is perhaps fortunate that the Canadian Waste Materials Exchange began nationally as expansion regionally will be facilitated through the existence of a central body.

11.6 Conclusions

A comprehensive information program could significantly enhance the use of recycling and reduction technology in industry. It could break through much of the silence engendered within industry due to competition; expand government, industry and public awareness of the important role of low waste technologies in effective waste management strategy; assist government in assessing the feasibility of recycling certain waste streams through precedents; and consequently divert waste streams from land disposal to more productive and conserving uses.

Industrial associations could assist by disseminating information on leading low waste technology, services and assistance available, and by engaging in discussions to promote resource conservation through recycling and reduction activity. Canadian Chambers of Commerce could also assist in promoting reduction and recycling through publicizing:
(a) cost savings associated with waste audits;
(b) the use of waste exchanges:
(c) the legal mechanisms available to ensure purity standards in recycled materials.

The expansion of the Canadian Waste Materials Exchange, promotion of waste auditing and establishment of technical assistance programs would also play significant roles in breaking down barriers to disseminating technical information on recycling and reduction.

11.7 Recommendations

It is recommended that Environment Canada:

(a) **Initiate the establishment of technical assistance programs with assistance to provincial and regional agencies.**
Initially such a program could be run voluntarily through the federal government with cooperation and some financial input from the provincial and regional governments. The preliminary assistance program could be available on a voluntary basis. To avoid some of the problems experienced in New York programs it is further suggested that a preliminary program be run apart from environmental enforcement agencies.

(b) **Develop a waste audit program, modelled after the energy audit program, for small and medium sized companies to promote the voluntary use of audits.**

(c) **Assist in and encourage further funding of the Canadian Waste Materials Exchange:**
(i) To allow CWME to research uses of those wastes now termed technically unfeasible to recycle.
(ii) To research the better use of other wastes.
(iii) To actively encourage further participation of industry through personal visits, interviews, seminars and more outreach work.
(iv) To identify waste streams that are recyclable at this time and to utilize the manifest system in identifying such waste streams.
(v) To assist in regionalizing waste materials exchanges.
(vi) To limit the problem of transporting wastes through better and localized publicity of waste needs and demands.
While there are several different formats for a waste exchange, the current national focus of the exchange structure should be maintained. The Canadian Waste Materials Exchange is developing expertise in the area of waste exchanges. It has also assisted in regionalizing exchanges and could expand in this field with proper staffing and funding. Expansion to different regions of the CWME would preserve a central information agency which would reduce complications in networking.

It is also recommended that the present government financial support of the exchange be maintained. Industry participation in the CWME does not appear to be contingent on the fact that it is government funded. Finally, a government-assisted exchange, which is not motivated by profit, will be more amenable to engage in a broader scope of research on the recycling potential of wastes generally.

(d) **Implement information sharing programs.**
A comprehensive information program should be coordinated by Environment Canada with participation from industry, provincial and regional

governments and public interest groups to share information on what is available technologically, financially and legally to encourage waste reduction and recycling activities in Canadian industries.

(e) **Implement information programs on financial assistance available.**
Most important on an immediate basis would be a manual outlining financial assistance available.

(f) **Conduct government information programs.**
Such programs could educate federal government officers, particularly enforcement officers, as to information available in negotiating enforcement orders and permits. This type of information could lead to greater cooperation and more cost effective solutions in meeting objectives of environmental legislation. An industry that might otherwise be obliged to invest in costly end of pipe pollution control equipment could be made more aware of process alternatives that would result in pollution control compliance and in economic savings.

(g) **Initiate round table discussions - ongoing.**
Environment Canada should sponsor round table discussions on how to further encourage reduction and recycling in Canada. Inter-sector discussions are essential at this point in order to overcome the most visible problems.

(h) **Implement public information programs on industrial waste reduction and recycling potentials.**
Environment Canada could also assist in overcoming the information scarcity by implementing public information programs. These programs would make the public more aware of current issues of recycling in the industrial sector. Programs, in conjunction with financial incentives to the public through taxation policies, would help consumers to make more informed choices in purchasing practices and to directly support reduction and recycling in the industrial sector. Information on industrial recycling might also encourage more individuals to participate in residential recycling and reduction programs.

It is also recommended that provincial governments:

(a) **Use the manifest system to categorize wastes that can be recycled.**
(b) **Implement local recycling information programs in cooperation with Environment Canada to inform the public and industry of the potential of industrial waste recycling.**
(c) **Develop means of identifying whether a product is made of recycled goods and provide consumer incentives to purchase on that basis.**
Sales tax exemptions for materials made from recycled goods to make recycled goods more identifiable to consumers should be considered.
(d) **Make the performance of a waste audit a precondition to permit applications.**

(e) Participate in information sharing with industry and other levels of government.
(f) Devise standards under the Canadian Standards Act and consumer standards to include considerations of the safe use of recycled goods or the use of waste minimizing technology to reduce the amount of hazardous wastes used in the processing of resources generally.

It is also recommended that:

(a) **Industrial associations and Chambers of Commerce disseminate information to member industries on low waste technology; recent developments in this area, financial assistance available, and waste exchanges.**

(b) **Industrial associations participate in information sharing and round table discussions with government on technology, developments and impediments to further application of low polluting technology.**

(c) **Industrial associations promote the use of waste audits.**

(d) **Industrial associations promote the use of waste exchanges.**

12. CONCLUSION

Waste reduction and recycling have an important role to play in waste management. Opportunities exist to turn waste problems to our advantage, if steps are taken now to do so. The time has come for their recognition through specific actions and incentives: economic, financial, legal and institutional.

The recommendations made should not be regarded as mutually exclusive. The suggestions made for industry, government and specifically Environment Canada are seen as coexistent. Together they can make effective inroads to overcoming the barriers to industrial waste recycling and reduction.

More research and investigation needs to be carried out in some areas before effective action can be taken. In many other instances effective steps can be taken immediately by government or industry to promote recycling and reduction and reduce the negative effects of the barriers studied here.

Recycling and reduction activities are significant in demonstrating the wise and efficient use of materials, energy and materials conservation, preservation of the environment and economic sufficiency. They are activities that can lengthen the lifespan of natural resources, enhance the environment and our quality of life generally.

13. RECOMMENDATIONS

13.1 Environment Canada and other federal departments

(a) Lack of Financial Incentives

(i) **Expand its budget for research and development into recycling and reduction technology.**
Financial assistance could be available in exchange for research and development relating to recycling and reduction. Assistance could follow the format of the D-RECT program but should have much better funding.

Assistance should be different than that offered under the D-RECT Program which assists projects, such as energy from waste, which are capital intensive and do not enhance resource reduction. Programs providing research and development assistance could encourage research and development in the areas of waste reduction and waste reuse internally, and into the means by which other wastes could be recycled. Such programs could be divided to assist research and development investment in recycling for smaller industries which otherwise do not have capital immediately available to do so.

(ii) **Encourage a more equitable view of recycled goods in income tax legislation** (see recommendations for Revenue Canada).

(iii) **Promote information packages on financial programs now available to assist industries in investing in recycling and reduction equipment.**

(iv) **Generally initiate more programs specifically directed toward financial assistance of industrial recycling and reduction activities.**

(v) **Assist Revenue Canada in implementing the following recommendations:**

(1) **A provision under The Income Tax Act for an accelerated capital cost allowance for investments in recycling or at source reduction equipment.**
A rate of write off of one to two years is recommended to encourage investment in low waste technology and in preventative practices rather than in conventional pollution control.

(2) **Amendments to the Excise Tax Act to exempt re-refined oil and other recycled goods from its application to encourage preferential purchasing practices for these goods.**

(3) **Implementation of an income tax credit for industries that have invested monies in a given tax year for operating or research expenses relating to reduction and recycling.**

(b) Incomplete Waste Disposal Pricing

(i) **Match on a percentage basis (between 25 - 75%) provincial revenues from fees with proportionate federal money to assist in regional reduction and recycling programs;**

(ii) **Use the manifest system to readily identify wastes that can be recycled.**

(c) Pollution Control Standards

(i) **Conduct information sharing programs on recycling and reduction technology for federal environmental enforcement officers to provide this information to industries in the process of setting control orders.**

(d) Lack of Legislation

(i) **Appoint a special coordinating or steering committee with representatives from industry, government and public interest groups to:**
(1) **Develop a comprehensive assessment of low waste technology use and potential in Canada,** and
(2) **Provide concrete means of implementing the technology in a two year span.**

(ii) **Develop the manifest system devised under the federal** Transportation Of Dangerous Goods Act **in order to identify and categorize wastes that can be recycled to enable industry to recycle such wastes where technologically and economically feasible.**

(iii) **Develop guidelines to encourage industrial waste recycling.** A reasonable mandate to recycle could be developed through applying the same principles as the provisions under the California legislation. These require the Department to investigate possible uses of waste which would otherwise be disposed by the industry, and propose that industry use materials that can be recycled, and impose a high fine only where the feasible alternatives proposed to the industrial waste generator are rejected.

(iv) **Legislation should be developed allowing Environment Canada to**
(1) **develop techniques for ensuring purity standards of recycled materials to enhance their use and to prevent contamination,**
(2) **oversee the operation of a waste audit program (see section 11),**
(3) **ensure that confidentiality procedures are in place to enable industries to make the best use of these programs without compromising proprietary information,**
(4) **implement a public information program on recycling and reduction in industries; an information program for industry through the use of**

newsletters, seminars, round tables, etc., and an information program for environmental officers (see next section),
(5) **conduct further research in the area of liability,**
(6) **conduct research and development in the technology of recycling.**

(v) **Encourage representation in the Canadian Standards Association to formulate standards for manufactured products that consider factors such as the longevity of the product, the degree to which the product uses recycled material in its process, and other factors that relate to non waste or low waste production processes.**

(e) Lack of Information on Reduction and Recycling Potentials

(i) **Initiate the establishment of technical assistance programs with assistance to provincial and regional agencies.**

(ii) **Develop a waste audit program, modelled after the energy audit program, for small and medium sized companies to promote the voluntary use of audits.**

(iii) **Assist in and encourage further funding of the Canadian Waste Materials Exchange:**
(1) **To allow CWME to research uses of those wastes now termed technically unfeasible to recycle.**
(2) **To research the better use of other wastes.**
(3) **To actively encourage further participation of industry through personal visits, interviews, seminars and more outreach work.**
(4) **To identify waste streams that are recyclable at this time and to utilize the manifest system in identifying such waste streams.**
(5) **To assist in regionalizing waste materials exchanges.**
(6) **To limit the problem of transporting wastes through better and localized publicity of waste needs and demands.**

(iv) **Implement information sharing programs.**
A comprehensive information program should be coordinated by Environment Canada with participation from industry, provincial and regional governments and public interest groups to share information on what is available technologically, financially and legally to encourage waste reduction and recycling activities in Canadian industries.

(v) **Implement information programs on financial assistance available.**

(vi) **Conduct government information programs.**
Such programs could educate federal government officers, particularly enforcement officers, as to information available in negotiating enforcement orders and permits. This type of information could lead to greater cooperation and more cost effective solutions, social and

environmental, in meeting objectives of environmental legislation. An industry that might otherwise be obliged to invest in costly end of pipe pollution control equipment could be made more aware of process alternatives that would result in pollution control compliance and in economic savings.

(vii) **Initiate round table discussions - ongoing.**
Environment Canada should sponsor round table discussions on how to further encourage reduction and recycling in Canada. Inter-sector discussions are essential at this point in order to overcome the most visible problems.

(viii)**Implement public information programs on industrial waste reduction and recycling potentials.**
Environment Canada could also assist in overcoming the information scarcity by implementing public information programs. These programs would make the public more aware of current issues of recycling in the industrial sector. Programs, in conjunction with financial incentives to the public through taxation policies, would help consumers to make more informed choices in purchasing practices and to directly support reduction and recycling in the industrial sector. Information on industrial recycling might also encourage more individuals to participate in residential recycling and reduction programs.

13.2 Provincial governments

(a) Lack of Financial Incentives

(i) **Allocate money to educational institutions to support research and development activities in the area of recycling and reduction in the industrial sector and specialization in waste minimizing technologies as a field of study.**

(ii) **Develop tax credits for small businesses conducting research or investing in innovative recycling and reduction activities.**

(iii) **Implement low interest loan grants for investments in innovative clean technology.**

(iv) **Develop research and development grants for innovative work in the area of recycling and reduction in the industrial sector.**

(b) Waste Disposal Pricing

(i) **implement application fee and permit fee for landfill use;**

(ii) **implement an additional fee or surcharge per ton of waste for waste disposal;**

The additional fee should be calculated to be commensurate with the true cost of landfill as a bare minimum, and should in not be limited to the following criteria:

(a) administrative costs of disposal sites,
(b) costs of public hearings,
(c) environmental costs,
(d) loss of land use,
(e) resource reuse loss, or
(f) health maintenance.

The estimated surcharge should be channelled into programs that encourage at source reduction or recycling in the industrial sector (further surcharges will be necessary for administration of a superfund and perpetual care).

(iii) **Work with the federal government in developing a study of the advantages and disadvantages of various methods of raising costs through surcharges, taxation, a fee per ton, etc., while applying a standard increase in cost per ton;**

(iv) **Work with the federal government in identifying wastes that can be recycled through the use of the manifest system.**

(c) Pollution Control Standards

(i) **Conduct information sharing programs on recycling and reduction technology for enforcement officers to provide this information to industries in the process of setting control orders.**

(ii) **Develop, with the municipalities, broader categorization and uniformity of sewerage bylaws to cover greater numbers of industrial users.**

(d) Lack of Legislation

(i) **Develop legislative programs to promote low waste technology that meet as a minimum the federal government program requirements.**

(ii) **Develop a list of materials that can be recycled through the use of manifest systems and waste inventories.**

(iii) **Investigate a restricted ban on landfilling for hazardous wastes with the aim of phasing out landfilling for toxic wastes in a scheduled time period.**

(iv) **Assist and cooperate with Environment Canada in developing directions for further legal and technological research.**

(e) Lack of Information on Reduction and Recycling Potentials

(i) Use the manifest system to categorize wastes that can be recycled.

(ii) Implement local recycling information programs in cooperation with Environment Canada to inform the public and industry of the potential of industrial waste recycling.

(iii) Develop means of identifying whether a product is made of recycled goods and provide consumer incentives to purchase on that basis. Consider sales tax exemptions for materials made from recycled goods to make recycled goods more identifiable to consumers

(iv) Make the performance of a waste audit a precondition to permit applications.

(v) Participate in information sharing with industry and other levels of government.

13.3 Industry and Industrial Associations

(a) Financial Incentives

(i) Make further financial contributions to educational institutions, and industry to encourage more specialized research into low waste technology.

(ii) Develop information packages on financial incentives available for implementing low waste technology.

(b) Lack of Legislation

(i) Encourage the use of legal contracts to certify purity standards of waste and to encourage waste exchanges.

(ii) Encourage representation in the Canadian Standards Association for the formulation of standards for manufactured products that consider factors such as the longevity of the product, the degree to which the product makes use of recycled material in its process, and other factors that relate to non waste or low waste production processes.

(c) Lack of Information on Reduction and Recycling Potentials

(i) Industrial associations and Chambers of Commerce disseminate information to member industries on low waste technology; recent developments in this area, financial assistance available, and waste exchanges.

(ii) Industrial associations participate in information sharing and round table discussions with government on technology, developments and impediments to further application of low polluting technology.

(iii) Industrial associations promote the use of waste audits.

(iv) Industrial associations promote the use of waste exchanges.

13.4 Further Research

More research is required in the following areas:

(a) the effects of transportation rates and policies on the mobility of reusable and recyclable materials;

(b) the advantages and disadvantages of various methods of raising costs of waste disposal through surcharges/taxation/amount per ton, etc.;

(c) pretreatment methods and the implementation of pretreatment standards;

(d) development of consistent standards for pollution control;

(e) application of standards in non environmental legislation to encourage low waste processes in the manufacture of goods.

NOTES

1.Michael G. Royston, Pollution Prevention Pays, Pergamon Press, Toronto, 1979, Foreword at (ix).

2. See general discussion in J.F. Castrilli, Hazardous Waste Management in Canada: The Legal and Regulatory Response, Canadian Environmental Law Research Foundation, September 1982, at 4.

3. 3M Company, Low or Non Pollution Technology Through Pollution Prevention: An Overview, United Nations Environment Program, Office of Industry and the Environment, at 16-18.

4. idem, at 25.

5. idem, at 27.

6. D. Sarokin, Source Reduction of Hazardous and Toxic Wastes: Obstacles and Incentives, Abstract, INFORM Inc., New York, New York, at 2-4.

7. Monica E. Campbell and William M. Glenn, Profit from Pollution Prevention: A Guide to Industrial Waste Reduction and Recycling, Pollution Probe Foundation, Toronto, 1982, at 143.

8. idem, at 289-290.

9. personal communication, Doug Lisle, Technical Advisor, Canadian Chemical Producers Association, December 1983.

10. These are figures from Environment Canada, November 1983. The full statistics are outlined below.

Sector	Waste Tons/yr	Presently recycled Tons/yr	Recycling potential Tons/yr
Agriculture			
Crop	44,000,000	36,000,000	8,000,000
Animal	18,000,000	7,000,000	11,000,000
Mine			
tailings	650,000,000		
Industrial			
wood	32,000,000		
other	31,000,000		
ferrous		7,000,000(CARI)	20,000,000
non ferrous		1,000,000(CARI)	to be studied
paper stock		1,000,000(CARI)	
Sewage	4,000,000		
Hazardous	3,500,000		to be studied - disposal cost of $700,000,000/yr.
Municipal	13,000,000		
heat recovery		650,000	
paper & cardboard		200,000	5,000,000
glass			830,000
ferrous			780,000
non-ferrous			80,000
plastics			670,000
textiles, rubber			570,000
putrescibles			2,550,000
other			1,630,000

11. Proctor and Redfern Group, Background Paper: Waste Reduction, Ontario Waste Management Corporation, Toronto, July 1982, at 5-6.

12. idem

13. To develop reasonable estimates of reduction and recycling potentials and savings, it would be appropriate to conduct a feasibility study of waste reduction potentials on an industry, sector by sector basis. Making reduction potential estimates is impossible at this time because there are no full statistics on waste quantities by small operators at this time.

14. see generally Steven J. Marcus, "The Recycling of Chemical Waste" The New York Times, Sunday, Jan. 8, 1984. The article discusses alternatives to burial of toxic wastes and some of the U.S. laws now acting as a catalyst for applying alternative technologies. Most Canadian

jurisdictions developing waste reduction strategies perceive the application of such strategies as focal to future waste management.

15. See generally Campbell and Glenn at note 7 and Royston at note 1. See also section 3.3 of this report.

16. Ted Schrecker, The Conserver Society Revisited, A Discussion Paper, Science Council of Canada, Minister of Supply and Services, 1983 at 28.

17. Michael Keating, "Recycling Gets Push From Caccia", The Globe and Mail, November 25, 1983 at 18.

18. The Honourable Keith Norton, Q.C., Minister of the Environment, Ontario, Remarks to the Thirtieth Ontario Industrial Waste Conference, Toronto, June 13, 1983, at 5.

19. W.U. Chandler, World Watch Paper 56, Materials Recycling: The Virtue of Necessity, World Watch Institute, October 1983.

20. Jill Flett, Draft, Recycling Hazardous Wastes, Environmental Law Centre, 1983 at 40.

21. Great Lakes Basin Commission Staff, Implementation Report on the Great Lakes Basin Commission's Hazardous Materials Strategy, Great Lakes Basin Commission, Michigan, January, 1981.

22. See note 7 at 43.

23. see note 1 at 38.

24. See Hazardous Waste Management in British Columbia. Report of the Hazardous Waste Management Advisory Committee. Their desirable hierarchy for dealing with hazardous waste is: (a) Do not generate the wastes; (b) Recycle or reuse wherever possible; (c) Treat the waste on the site of the generator wherever possible; (d) Treat and dispose of the wastes at a facility designed and operated for hazardous waste disposal. See also the Environmental Council of Alberta, Public Hearings on Hazardous Waste Management in Alberta: Report and Recommendations (Edmonton: E.C.A., December 1980) at 94 to 97 and 217. See also the report prepared by MacLaren Engineers, The Siting of Facilities and the Management of Liquid Industrial and Hazardous Waste in Ontario. (Toronto: M.O.E., November 1980). See also Proctor and Redfern, Waste Reduction Background Paper, Ontario Waste Management Corporation, at 1. See note 2 at 66.

25. Canadian Chemical Producers Association, Policy Paper on Hazardous Waste Handling and Disposal, at 12, "Four basic questions can be asked about any industrial waste material: Can it be eliminated at its source? Can it be recycled, either by the generator or another expert party? If it is hazardous, can it be converted into a non-hazardous form? If it must be disposed of, how can it be most effectively and efficiently processed? See also OWMC Waste Reduction Background Paper, note 11 at 1.

26. see note 7 at 6.

27. Definitions are based on many sources. In particular, see note 7 at 7. See also, National Council on Resource Recovery, Briefs, Glossary, U.S. Jun 1980. See also definition in Toxic Waste Assessment Group. Alternatives to the Land Disposal of Hazardous Wastes, An Assessment for California, Governor's Office of Appropriate Technology, State of California, 1961.

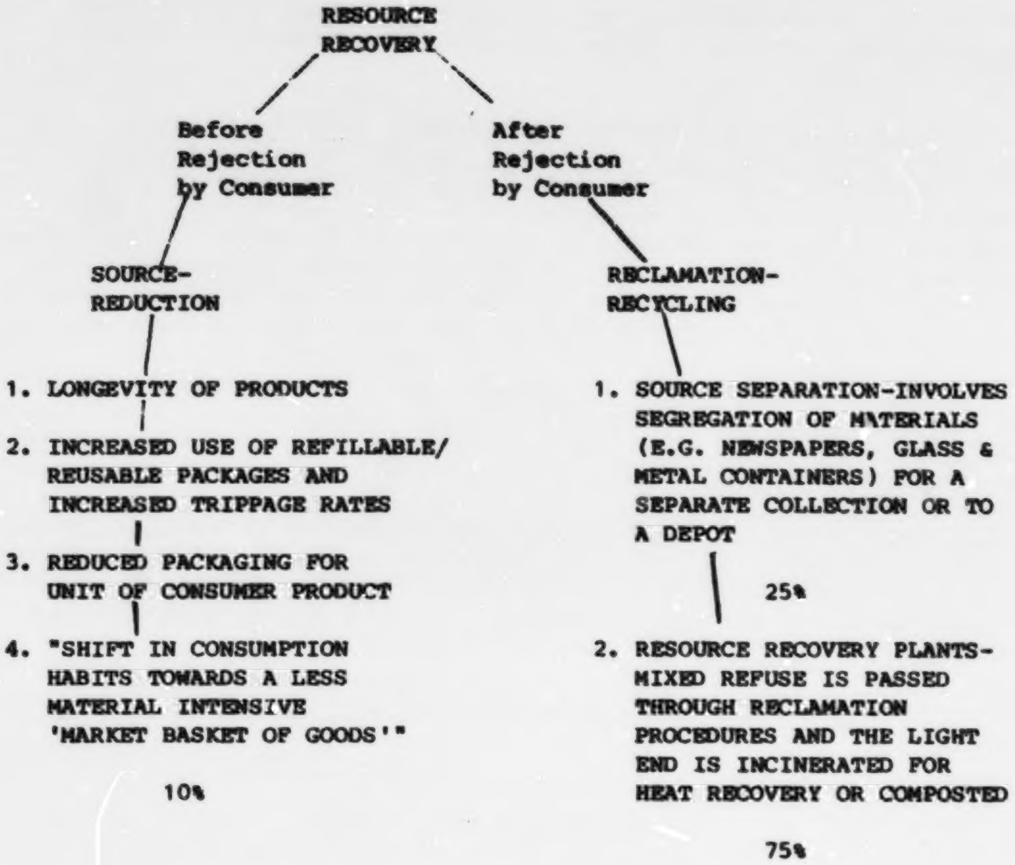
28. Blueprint for Waste Management in Ontario, Appendix 2, Waste Reduction, Reuse, Recycling and Recovery Report, Ministry of the Environment, 1983. This report refers to these four areas of waste minimizing throughout the Blueprint. (The United States Environmental Protection Act has also adopted "four Rs" in its program -- these are reduction, recycling, reuse and reclamation). In the Blueprint, waste reduction is defined as relating to, very broadly, the reuse of wastes, the durability of or repairability of a product, the design of goods and packaging.
cf. Appendix 2 of the Ontario Ministry of the Environment Blueprint at 2-3. Waste reuse is defined as direct reuse of a waste, such as the refillable glass container. Waste recycling is defined as the use of a waste material as a replacement for all or part of a virgin material in a manufacturing process. The waste material is used because of its value, see Appendix 2 at 3. Resource recovery is defined as the processing of waste for material or energy recovery. This includes conversion of solid wastes to a usable processed product, such as refuse derived fuel or compost, and incineration or unprocessed waste to produce energy, which is recovered in a usable state, page 4 to 5, Appendix 2 of the Blueprint.

29. Environment Canada Response to Ontario Minister of Environment Blueprint, December 1983.

30. Proctor and Redfern, Ontario Research Foundation, and Weston Designers-Consultants, Waste Reduction Opportunities Study, Ontario Waste Management Corporation, May 1983, at 8. In the background paper at note 11 at 12 waste reduction is defined as: "the reduction of the quantity of waste through good housekeeping practices or by the application of concentration technologies. Also, the reduction of the degree of hazard of waste through simple in plant treatment." At 13, waste reuse is defined as the direct reuse of a raw material of a waste stream as is, or with modification. At page 15, waste recycling and recovery is defined as the reclamation of value from waste streams through the application of reprocessing technologies, such as distillation, etc.

31. Manitoba Information Services, August 12, 1983, Speech, Provincial Minister of Environment, Jay Cowan.

32. The diagram of definitions for Resource Recovery, from Environment Canada, Waste Management Branch, November 1983, is shown here:



RESOURCE RECOVERY

Before Rejection by Consumer

After Rejection by Consumer

SOURCE-REDUCTION

1. LONGEVITY OF PRODUCTS
2. INCREASED USE OF REFILLABLE/REUSABLE PACKAGES AND INCREASED TRIPPAGE RATES
3. REDUCED PACKAGING FOR UNIT OF CONSUMER PRODUCT
4. "SHIFT IN CONSUMPTION HABITS TOWARDS A LESS MATERIAL INTENSIVE 'MARKET BASKET OF GOODS'"

10%

RECLAMATION-RECYCLING

1. SOURCE SEPARATION-INVOLVES SEGREGATION OF MATERIALS (E.G. NEWSPAPERS, GLASS & METAL CONTAINERS) FOR A SEPARATE COLLECTION OR TO A DEPOT

25%

2. RESOURCE RECOVERY PLANTS-MIXED REFUSE IS PASSED THROUGH RECLAMATION PROCEDURES AND THE LIGHT END IS INCINERATED FOR HEAT RECOVERY OR COMPOSTED

75%

33. See note 28 at 6. Note also that the Ontario Waste Management Corporation's definition of recycling includes recovery projects; see note 30.

34. Harold Crooks, Dirty Business, James Lorimer Publishers, 1983, at 30. The author states:

> "Richard Goodacre of the Recycling Council of British Columbia pointed out one of the contradictions of the energy stations: 'We arrive at one of the inherent dilemmas of an expensive energy recovery operation: all other things being equal, the more garbage there is, the cheaper the operation. A problem arises if a recovery facility is running at optimum efficiency but there is not enough garbage to feed it; costs per ton automatically increase. This is precisely the situation that has evolved in Quebec City. The recovery plant there produces steam for a nearby paper mill which requires a steady supply of energy. The incinerator cannot guarantee a regular supply based on waste firing alone, because waste supply is not constant, and auxiliary oil burners haven't been installed to take up the slack.'"

35. Pojasek, R., "Stabilization, Solidification of Hazardous Wastes", *Environmental Science and Technology*, April, 1978.

36. *Environment Canada Response to Ontario Minister of Environment Blueprint*, December 1983.

37. The "economies of scale" argument is significant in determining the ability of a company to implement reduction and recycling technology. The technology applied for large operators could be scaled down to meet the needs of a small operator, but companies that are producing the equipment may not be aware that there is a market for scaled-down equipment and therefore may not take the financial risk of producing equipment that can be implemented in smaller industries. On the other hand, smaller operations tend to have more flexibility in their processes and, from that perspective, may be in a better position to apply preventative technology.

38. See Appendix A, showing responses to letter sent to provincial environmental protection ministries.

39. F.T. Gerson, *Materials Recycling: History, Status, Potential* Science Council of Canada, Ottawa, 1977 at 73. See also Paul Taylor, *The Barriers to Recycling*, Secondary Resources Development Council at 11. In this study, it is stated that the lack of risk capital available for secondary resource development as opposed to primary resource development and incomplete primary resource cost poses serious problems for recycling industrial scrap. See also the Canadian Association of Recycling Industries (CARI). *Response to the Blueprint for Waste Management in Ontario*, Oct. 1983 at 5. See also the CARI National Policy for Recycling, at 6. In this paper, CARI recommends that a national recycling policy should have the following as a general objective:

> "to create an economic environment conducive to the efficient allocation and utilization of the nation's recyclables which are either newly created or reutilized after discard."

The study goes on to list a number of areas in which government could assist in reaching this objective: transportation, research and development, tax incentives, education and awareness promotion.

40. See note 7 at 9.

41. F.T. Gerson, *Utilization of Aluminum and Copper Scrap Metals*, Canada Solid Waste Management Report E.P.S. 3 - E.C. - 76, December 1976, at 137.

42. ERA Consulting Economist Inc., *Assessment of Fiscal Instruments Available to the Federal Government Which Could be Used to Obtain Increases in the Quantity of Used Oil ReRefined in Canada*, ERA, Montreal, Quebec at 24.

43. See generally Section 11.2 of this report.

44. See note 7, at 388. The example given follows:

Capital cost of recycling equipment	$30,000.00
Costs to recover 1 pound of material....	.20
Value of 1 pound of material	1.00
Savings per pound through recovery......	.80
For a system recovering 300 pounds per week, yearly savings are..................	$12,480.00
Pay-Back Period.........................	2.4 years

This calculation of pay-back period does not include the cost of borrowing which could add considerable time to the pay-back period.
Regarding financial savings associated with low waste technology see W. Howard Rapson and Douglas W. Reeve, 'Non-Waste Production of Bleached Kraft Pulp', Non Waste Technology and Production, 1976 at 379. At 382 the authors compare capital and operating costs of the conventional and low waste technology:

> The operating cost (including the cost of capital) of a closed-cycle mill, taking into account the increased yield of pulp on wood, the energy saving, fibre saving and the lower water cost, would likely be less than that of present mills without effluent treatment. The operating cost of a new mill with primary treatment, secondary treatment, slude removal and colour removal is about 5 percent higher than that of a mill without effluent treatment. Yet all the colour, much of the toxicity and about 10 percent of the oxygen-consuming matter still remain in the effluent after treatment. To decrease the pollutant load further by external treatment would increase both capital and operating cost exponentially. Therefore, it is very much cheaper to eliminate water pollution by internal recycle of process water.

45. Paul Taylor, at note 39.

46. See Appendix A.

47. A personal communication sent to a representative of the Canadian Association of Recycling Industries has not received a response in this regard. See also note 39 at 68. Representatives of the Ontario Trucking Association did not identify a discrepancy. See J. Michael Joyce, A Commentary on the Existence of Discriminatory Freight Rates With Respect to Secondary Materials, Waste Management Advisory Board, June 1976.

48. ibid. Personal communication with Giles Endicott, formerly of the Ontario Waste Management Advisory Board, November and December 1983.

49. A letter sent to Canadian National with hypothetical situations and cargo received this response from W.H. Shaw, Chief Rate Advisor:
"Calgary to Toronto, used Petroleum oil, Tarriff CFA-103-U, Item 6584, subject to minimum weight 150 M., rate 4.42 per 100 lb.

Hamilton to Montreal, Metal, Tariff CFA-4445, Item 17750, minimum weight 80 M., $1.15, 100 M. 1.05, 120 M. .94, 140M. .90 all per 100 lb.

Hamilton to Montreal, Scrap Metal, Tariff CFA-4445, Item 75500, minimum weights 90 M., $18.98, 100 M. 17.89, 120 M. 17.15, 140 M. 16.40. rates per ton to 2,000 lb.

Toronto to Montreal, Plastic, Tariff CFA-3400, Item 3650, minimum weight 160M., rate 1.24 per 100 lb.

Toronto to Montreal, Waste Plastic, Tariff CFA-455, Item 30550, per car charge on weight to 60 M. $1,451.00. Excess weight over 60 M. rate is 1.03 per 100 lb.

Hamilton to Montreal, Solvents, Tariff CFA-455, Item 30550, per car charge on weight to 60 M. $1,714.00. Excess weight over 60 M. 1.64 per 100 lb.

Hamilton to Montreal, Solvent Residue, Tariff CFA-455, Item 30550, per car charge on weight to 60 M. $1,714.00. Excess weight over 60 M. 1.64 per 100 lb.

Thunder Bay to Toronto, Wood (Lumber), Tariff CFA-103U, Item 1170, minimum weight 80 M. 1.62, 90 M. 1.58, 100 M. 1.55 all per 100 lb.

Thunder Bay to Toronto, Woodchips, Tariff CFA-4550, Item 73400, minimum weight 80 M. 4.01.

Thunder Bay to Toronto, Pulp, Tariff CFA 103-U, Item 9175, minimum weight 120M. rate 1.75 per 100 lb.

Regular Petroleum Oil such as your request from Calgary to Toronto is not transported by rail between Western Canada and Eastern Canada, because of Federal law restrictions."

50. International Resource Recovery Group. The Implementation of a National Recycling Policy for Canada, in house document, Environment Canada, at 7.

51. Paul Taylor, at note 39.

52. See generally, ERA Consultants, Fiscal Policies to Increase the Use of Reused Oil, at note 42.

53. See generally, Paul Taylor, Recycling Council of Ontario Survey at note 39; Environment Canada file 4666-1, Memo to MOE Auld; Proctor and Redfern study at note 11; International Resource Recovery Group at note 49.

54. personal communication with Geoff Rathbone, Environment Canada, Toronto, January 1984.

D-RECT funding	
$302,000	78/79
$454,000	79/80
$657,000	80/81
$894,000	81/82
$944,000	82/83

55. DREE, 1981 Annual Report, Department of Supply and Services, Ottawa, 1981, at 324.

56. Michael Jenkin, The Challenge of Diversity, Industrial Policy in the Canadian Federation, August, 1983.

57. note 55 at 3-4.

58. personal communication with Ken Hibbert, Enterprise Development Program, November 1983.

59. personal communication with D.G.T. Cooper, IRAP - P, Element Manager, December 30, 1983.

60. idem.

61. See note 59 and note Appendix C which shows the success rate on these projects of 36%, a failure rate of 20%, a rejection rate of 18% and a rate of 25% for projects that are too early to forecast.

62. personal communication with C.Y. Pelletier, Quebec Ministry of Environment Interdepartmental Co-ordinator. November 1983, January 1984. Regulations have recently been promulgated.

63. personal communication with Harold Middleton, Manager, Industrial Products, B.C. Ministry of Industry and Small Business Development, November 24, 1983.

64. personal communication with Paul Brockington, Industry Branch, Manitoba Department of Economic Development and Tourism.

65. Eleven ways that We Can Help Small Business, Ministry of Industry and Tourism of Ontario at 15-16. One example of an Ontario program that would relate to recycling and reduction is the small business industry technology program which assists new projects in product development of processes up to a maximum of $15,000.

66. There are other federal programs which can help fund industries and these shall be briefly noted here. These include the Federal Business Development Bank (FBDB). The FBDB exists to provide funding to companies not able to raise capital on reasonable terms and conditions. Most successful applicants used their funds to purchase land, building or equipment. The Natural Science and Engineering Research Council (NSERC) will help specific specialized personnel and contribute up to $20,000 per annum towards their salary for the first three years and up to $10,000 per annum for two years after that if the graduate is employed in research, development and innovation activities. The NSERC also administers a short-term employment assistant program of undergraduate industrial summer students and will pay up to $600 a month towards salary expenses in employment involving research and development. These programs are broadly based but also offer the opportunity for companies to work towards changing their waste handling practices.

67. At least in the case of the recently defunct E.D.P. Program, it appears

no statistics were kept as to the number of requests actually made for financial assistance in the implementation of recycling/recycling technology.

68. The accelerated capital cost allowance for pollution control equipment used to run for a period of two years at 50% each year. It now provides for a three-year span with a write-off of 25% in year one, 50% in year two and 25% in year three. Normally, the rate of depreciation would be somewhere between 5 and 20% each year. The program has definitely been extended with one qualification. If pollution control assets are required for a building or plant, construction of that building or plant in question must have commenced under a written agreement period prior to 1974.

69. Administrators of the Act look at factors such as the increased rate of return after installation of the equipment to determine whether this second test has in fact been met or whether the measure really has as its prime reason economic savings and process efficiency. Personal communication B.T. Letang, Finance and Administration Branch, EPS, Ottawa, Nov. 1983.

70. The Excise Tax Act, R.S.,C. 100.

71. Joseph Chalhoub, President of Canadian Association of ReRefiners, letter to The Honourable Marc LaLonde, Minister of Finance, Sep. 24, 1982.

72. idem See also J.D. Reid, Presentation to the 1981 Solid Waste Management Workshop: Government Refuse Collection and Disposal Association, Canadian Prairie Chapter, Regina, April 23, 1981.

73. A. Shimbashi, 'Relief of Sales Tax on Re-Refined Lubricants', April 19, 1981.

74. Personal communication with Ken Simpson, Alberta Ministry of Environment, December 1983; personal communication with Michel Gauvin, Quebec Ministry of Environment, November 1983; Ontario Ministry of Environment Blueprint, Appendix 2 at note 28.

75. Locals 43 and 49 of the Canadian Union of Public Employees, The Metropolitan Toronto Civic Employees Union and the Toronto Municipal Employees, Brief Regarding the Waste Management Master Plan for Metropolitan Toronto to the Executive Committee, The Municipality of Metropolitan Toronto, March 6, 1981 at 36. This is also true in the United States. See Michael D. Halgren "Recycling and Resource Recovery: State and Municipal Legal Impediments," Columbia Journal of Environmental Law, Vol. 7-8, 1980 to 1982 at 5.

76. see note 74 above. See also, for example, Ontario Municipal Association (OMA) Response to Blueprint, 1983. However, the OMA does not endorse raising the cost as a solution to this problem. See also the Ontario Waste Management Association Response to Blueprint. See also the The Canadian Chemical Producers Association (C.C.P.A.) response to Blueprint.

77. see for example, the Ontario Waste Management Association (OWMA)

Response to the Ontario Ministry of Environment Blueprint, the Ontario Municipal Association (OMA) response to the Blueprint.

78. Paul Palmer to the Sierra Club, August 20, 1980, found in Samuel S. Epstein, M.D., Lester O. Brown and Carol Pope, Hazardous Wastes in America, Sierra Club Books, San Francisco, 1982 at 361.

79. R.A. Finlayson, "Hazardous Waste Fee Systems", Solid Wastes Management 25(9): 33-4; 46, 1982.

80. see generally, Dr. D. Smith and C.H. Roy, C.E.F., "What Does Disposal Really Cost." Enviroscope, Aug. 1982, 40. This article examines the metal finishing industry and what is required to motivate recycling and reducing of goods in that sector given that substantial information is already available on reduction and recycling in that sector. Note also the following quote from Recycling and Resource Recovery: State and Municipal Legal Impediments; at note 73 at page 5.

> "The failure of the product price to reflect the social cost is both inequitable and inefficient. It is inequitable to require the taxpayer, who may not have used the product, to pay for its disposal, while that manufacturer and the actual user enjoy the benefits of the disposal and a clean environment. It is inefficient in that when the full costs of using a product are not reflected in its price, consumers and producers lcack a direct monetary incentive to minize those costs. Instead, consumers receive the cost of using products to be lower than it actually is. This encourages them to purchase more costs and not to recycle. Under full cost pricing, consumers might shift their purchasing more towards low waste items, such as returnable commodities and longer-lived durable goods and would be more likely to recycle purchased items. Producers, in turn, might use more secondary material in production or redesign products to reduce material requirements or to improve recyclability. Thus, the failure of consumer product markets reflect all waste management costs amounts to an implicit subsidy for physically and economically wasteful production and consumption habits."

81. Personal communication with Michel Gauvin, Director of Hazardous Waste, Ministere de L'Environment, Nov. 1983.

82. idem

83. idem

84. See the Blueprint Appendix 2 at note 28; personal communication with Ken Simpson of the Alberta Ministry of Environment, Dec. 1983.

85. Personal communication with Ken Simpson, Ministry of Environment, Alberta, December 1983.

86. Ontario Ministry of Environment Blueprint, Appendix 2, at note 28.

87. Personal communication with Tom Armstrong, Waste Management Branch, Ministry of Environment, Ontario, December 22, 1983.

88. see Ontario Ministry of Environment Appendix 2 at note 28.

89. G.A. Bulanowski, G.H. Lazarus et al, A Survey and Analysis of State Policy Options to Encourage Alternatives to Land Disposal of Hazardous Waste, National Conference of State Legislatures, Denver, Colorado, July 1981 at 18.

90. Finlayson at note 79.

91. idem

92. Ontario Waste Management Association (OWMA) Response to the Ontario Blueprint, October 28, 1983, at note 76. See also Ontario Liquid Waste Carriers' Association, Brief to the Ministry of Environment on the Blueprint for Waste Management, Nov. 24, 1983 at 8-9; Canadian Steel Environmental Association, Submission to the Ontario Ministry of Environment Concerning the Development of a Blueprint for Waste Management, Nov. 1983, at 16; Canadian Chemical Producers' Association, Response to Ontario Ministry of Environment Blueprint, Jan. 30, 1984 at 3-4. These associations do not endorse an artificial hike in the cost of disposal. Interestingly, the Regional Municipality of Peel does support a surcharge as long as the money levied can be used for recycling and reduction activities within the municipality. See the Regional Municipality of Peel, Response to Blueprint for Waste Management, December 1983 at 2-7.

93. Ontario Waste Management Association (OWMA) Response to Blueprint at note 76, at 89.

94. See for example Appendix 10 of the Blueprint at note 28.
Note that while this appendix attempts to draw parameters to determine how much waste disposal really does cost, its focus is on internal and not on external costs, such as environmental, social and health costs of disposal.

95. Michael Royston, note 1, at 39.

96. Dr. C.F. Runge, "Positive Incentives for Pollution Control in North Carolina", in Making Pollution Prevention Pay, D. Huisingh, ed., Pergamon Press, Toronto, at 123. See notes 1, 3, and 7 generally.

97. see note 3 at 17. Each year the program prevents the creation of these pollutants:

	U.S.	International
Air pollutants	123,000 tons	4,000 tons
Water pollutants	4,000 tons	150 tons
Waste water	900 million gal.	279 million gal.
Sludge/Solid Waste	12,000 tons	1,500 tons

98. Campbell and Glen, Profit from Pollution Prevention at 3.

99. note 6.

100. Dr. Michael Royston,"Opportunities for Clean Technology in North Carolina", Making Pollution Prevention Pay, at 42 at note 96.

101. There are several other examples in Canada and U.S. and those in the text are cited only as examples. See generally Campbell and Glenn at note 7; The Waterloo Industrial Waste Management Newsletter, Information Centre of Waterloo Industrial Waste Management Program, for more examples.

102. "Study finds polluting more profitable", Globe and Mail, March 2, 1984, B, 10. The study was prepared by Peat Marwick and Partners of Toronto.

103. idem

104. note 96 at 127

105. idem

106. J.F. Castrilli, Hazardous Waste Management in Canada: The Legal and Regulatory Response, Canadian Environmental Law Research Foundation, 1982, at 86. Discusses lack of national standards and constitutional arguments for national standards.

107. Epstein, Brown and Pope, note 78, at 321.

108. idem

109. Nora Goldstein, "Metal Finisher Takes Pretreatment Plunge," Biocycle, Nov/Dec. 1982 at 27.

110. For example, this view has been suggested by Doug Lisle, Technical Advisor to the Canadian Chemical Producers Association. Personal communication, December, 1983.

111. See Conference Proceedings: Making Pollution Prevention Pay in the Electroplating and Metal Finishing Industries, Charlotte, North Carolina, April 1983 at 30.

112. For example, the Ontario Blueprint for Waste Management Appendix 2, note 28, at 6 states that "Since there will always be a need for landfill, prudent waste management planning for future needs is essential", and at page 18 "It is highly unlikely that there will be a major breakthrough in solid waste management technology or waste management technology or waste generation rates in the near future that will significantly effect the plans made now."

113. see note 18.

114. G.A. Bulanowski, G.H. Lazarus, et al A Survey and Analysis of State Policy Options to Encourage Alternatives to Land Disposal of Hazardous Wastes, National Conference of State Legislatures, Office of Energy, Science and Natural Resources, July 1981 at 25. The authors list the following as methods of creating legal incentives:

"A. excluding certain materials or facilities from the regulatory program;
B. excluding certain facilities from permit requirements;
C. expediting or permitting of alternative technology

facilities;

D. restricting the land burial of specified hazardous wastes;

E. providing for liability standards for alternative facilities.

115. Manifest systems in the United States have been used to identify recyclable materials by both the New York Environmental Facilities Corporation and the California Department of Health. In this way, government agencies have been able to further channel toxic wastes into recyclable streams and reduce the amount of waste that needs to be disposed.

116. note 7 at 187. More energy is lost through incineration of waste plastics than through recycling a waste plastic to fabricate a new shape. If waste plastic is incinerated there is the loss of a resin. More energy is required to remanufacture a resin than to press out a new shape in recycled plastic. The following table from J. Milgrom, "Recycling Plastics: Current Status", *Conservation and Recycling*, Volume 3, 1980, shows energy savings through recycling various plastics as opposed to incinerating, thereby necessitating remanufacture of the resin (from Campbell and Glenn, note 7 at 187):

ENERGY SAVINGS IN RECYCLING VARIOUS PLASTICS

END PRODUCT	ENERGY CONTENT	
	RESIN	FABRICATION (reshaping)
PVC 1/2 gal. container	85	15
HDPE 1 gal. container	90	10
LDPE 1 gal. produce bag	94	6
POLYSTYRENE meat tray	83	17

117. If a private enterprise has a storage facility on site for blending and treatment, it will be subject to the requirements of Part V, though not to a hearing under Part V. Note comments of, for example, Canadian Environmental Law Association, *Response to Ontario Ministry of Environment Blueprint*, Nov. 1983 at 5, "Instead of easing controls to encourage the recycled use of these materials as the Blueprint recommends, we suggest that environmentally unsafe methods of recycling and reduction be subject to regulation. In addition, we recommend that recyclable hazardous material transported on public highways not be exempt from waybill provisions". Waste derived fuel is presently exempt from part 5 of the Ontario Environmental Protection Act which deals with waste management. The Ministry of Environment in Ontario recognizes energy from waste and materials from waste projects as part of the recycling policy and this exemption appears to encourage industries to use industrial waste as a fuel supplement by exempting such industries from the illegal processes under the Act. Pollution Probe's submission to the Ontario Ministry of Environment Blueprint echoes some of CELA's concerns about some definitional exclusions or exemptions:

> "Probe feels very strongly that this exemption under part 5 of the Environmental Protection Act is not acceptable, and projects like the current experimentation with liquid industrial waste as a fuel by the Canada Cement Lafarge Company in Woodstock under part 5 of the EPA (or in the future under the EAA). There is no

(environmental) difference between a commercial company like Tricil, incinerating waste and in an industry wishing to use wastes as fuel. Indeed, a private company using waste as fuel would be under much less scrutiny than a company incinerating hazardous wastes, while they both might be handling equally hazardous material. Under American law, (RCRA), combustible waste that has a "beneficial reuse" as boiler fuel has been exempted from regulation. A recent Congressional report states that because of this loophole in the law half of all hazardous industrial waste is burned in furnaces not designed as high temperature incinerators, and that such burning poses "direct threats to human health, and the environment." This and recent Senate Sub-Committee reports of widespread burning of PCB contaminated boiler fuel in New York City, should lay to rest the fallacy of allowing indiscriminate use of industrial waste as fuel." Joanna Kidd, Submission on the Ontario Ministry of Environment's Blueprint for Waste Management, Pollution Probe, 12 Madison Avenue, Toronto, M5R 2S1, October 1983.

118. Massachusetts Hazardous Waste Management Regulations 310 Code of Massachusetts Regulations 30.355, 30.100.

119. Personal communication with Michel Gauvin, Director, Management of Dangerous Wastes, Quebec Ministry of Environment November 3, 1983. See also "Politique Quebecoise de Gestion des Dechets Industriels, Quebec Ministry of Environment, May 1981 at 11. This policy document outlines the different phases of this policy from 1970 to 1980 and includes as part of that process in 1978 the banning of toxic wastes from sanitary landfill sites and the planning of treatment centres for toxic wastes. This approach - prohibiting waste landfill - has also been taken in California and New York.
Alberta environmental policies regarding recycling are only now being put into effect, but it appears that recycling will be given the priority in the waste management although no regulatory stipulations have been laid down as yet. Personal communication with Ken Simpson, Director, Waste Management Branch, Alberta Ministry of Environment, November 25, 1983.

120. The Environmental Health Act, Title 22 California, chapter 30, Minimum Standards for Hazardous and Extremely Hazardous Wastes, section 66763, Recyclable Hazardous Waste Disposal Statement. This provision requires that a producer of hazardous waste that is recyclable may be requrested to provide the Department of Health with a written statement justifying why the producer has not recycled the waste in question. The producer must comply with the Department's request within 30 days. A second example is in Arkansas law which provides that no oily hazardous waste shall be disposed of in landfills where it is technically feasible that the destruction of the waste can be accomplished by incineration.

121. see for example the Ontario Environmental Protection Act, R.S.O., 1980. C.141 part 10, section 113.

122. note 20

123. Gail Tapscott, "Disposal Phaseout of Some Wastes Proposed", Solid

Waste Management, Nov. 1982 at 49.

124. Toxic Waste Assessment Group, Alternatives to the Land Disposal of Hazardous Wastes, An Assessment for California, Governor's Office of Appropriate Technology, State of California, 1981, at 188-190.

125. Gail Tapscott, note 123, at 50.

126. California Health & Safety Code, Section 25122.5. Other types of material that may be recyclable are outlined under this section and include any retro-grade material not being used or reclaimed through treatments by the original manufacturer or owner by the later of some dates. A recyclable material does not include a chemical intermediate, a byproduct with a commercial use or ordinarily used in the industrial or agricultural community or material routinely reclaimed by the original manufacturer.

127. Health and Safety Code, Hazardous Waste Control, Ch. 6.5, Article 1, Findings & Declarations, s 25100

128. Industrial Materials Recycling Act, 1982, sections 1, 2, & 3, see also the New York Environmental Facilities Corporation Annual Report (required under the Industrial Materials Recycling Act) July 31, 1982 at page ix.

129. California Health and Safety Code, section 25.75 (b).

130. Personal communication, Robert McCormick, Department of Health Services, Sacramento, California, December 23, 1983.

131. The only other example of a 'mandate' falls in the area of waste exchanges in some European jurisdictions such as Germany. The industry is under an obligation to join the Chamber of Commerce which also administers the waste exchange. In Europe Chambers of Commerce are largely operated by the government,

132. "Hazardous Wastes PCBs Linked to Recycling, Recoup, October 1981, volume 1, number 5.

133. "Plastics recycling industry blooming in Canada," Recoup, June 1, 1981, volume 1 number 3 at 34.

134. Robert Pojasek, PhD., Vice President Weston Consultants, memo, Random Thoughts on Waste Solvent Workshop, February 9, 1982.

135. Lack of information has been identified as a problem in many areas. A recent study done by an American group called Inform, identified lack of information as a key obstacle to promoting the concept in technologies of source reduction. See, D. Sarokin, note 6, New York, 1983. See also the Ontario Blueprint for Waste Management, Appendix II at 12. See Proctor & Redfern, O.W.M.C. Waste Reduction Opportunities, note 11, at 1-2. "In 1981 Pollution Probe recommended to O.W.M.C., amongst other things, an information transfer among businesses, particularly between small companies that share similar pollution abatement problems."
Personal communication with Ken Simpson, Waste Management Director, Alberta Ministry of Environment, November 25, 1983: " Major hurdles to successful

industrial waste reduction, recycling and recovery programs in Alberta are industrial attitudes towards wastes...."

The Manitoba Environment Ministry also identified information as a major way of initiating a proper recycling reduction program (personal communication with Lorna Hendrickson, Manitoba Environmental Management Division, October 20, 1983). Nova Scotia also identified information as a problem and major factor affecting industrial waste control. Personal communication with Linda Laffin, Public Information Officer with the Nova Scotia Ministry of Environment, November 2, 1983. See also Globe and Mail, November 25, 1983 - "Recycling Gets Push from Caccia,": "Barriers to recycling include public resistance to some recycled products, transportation costs, technological difficulties and the fact that polluters often do not pay the true cost of dumping, he said". See also a study that was done on the barriers to recycling in all three of the industrial, commercial and residential sectors, which included a survey of various recycling industry's attitudes towards what are the barriers to recycling. Some of the information related barriers that were given a high score are: lack of awareness on the part of the public, indifference of the public. See Paul Taylor, note 39.

136. note 7 at 6 and note 6.

137. see the Waterloo Industrial Waste Management Newsletter, No. 2 at 6, "Research over the last few years has shown that many small businesses don't appreciate that their waste materials can, in fact, be hazardous, that small businesses don't usually have the resources to hire personnel knowledgeable in industrial waste management and that disposal costs of small quantities of waste can be very high. The combined effect of these factors can lead to poor waste management practices. Often we hear someone say that they only generate a few gallons of oily water or solvent "every now and then and surely that amount won't cause any harm in a landfill or sewage treatment plant."

138. The use of knowledge of reduction and recycling alternatives in negotiating environmental control orders was recently suggested at a conference in North Carolina: see Making Pollution Prevention Pay in the Electroplating and Metal Finishing Industries, Summary Report of a Workshop at Charlotte and Raleigh, N.C., April 13 and 14, 1983. At 30. Workshop discussion on how a community development committee will encourage implementation of the pollution prevent pays concept. The ways specifically suggested for the division of environmental management was, "during the permitting process and in working with non-complying facilities, owners will be encouraged to review innovative P.P.P. (i.e. Pollution Prevention Pays) concepts for bringing their facilities into compliance."

139. note 28

140. Personal communication with Wendy Wharton, Researcher, Association Policy and Activities, Consumers Association of Canada, Ottawa, January 3, 1984. Some of the resolutions that have been passed by the Consumers Association of Canada, which concern recycling and reduction, include a request to the Department of Consumer and

Corporate Affairs to add a regulation to the regulations under the Consumer Packaging and Labelling Act, requiring the use of standardized returnable containers in metric by the soft drink industry, (1974).

141. Office of Solid Waste, Fourth Report to Congress, Resource Recovery and Waste Reduction, U.S. Environmental Protection Agency, 1977, at xviii and at 88-95.

142. Press Release, "Environment Canada Adopts a National Recycling Symbol", January, 1984.

143. Waterloo Industrial Waste Management Newsletter, No. 1, Waterloo Information Centre, Waterloo, Ontario, 1983.

144. note 7, Chapter 1 outlines some of the information services that are available to assist industry in developing reduction or recycling technology.

145. Section 1285-g Public Authorities Law, N.Y., 1981. N.Y.

146. Industrial Materials Recycling Program, Status Report, Fall 1983, volume 3, number 3, at 4.

147. Industrial Materials Recycling Program, Annual Report, 1983-84 at 18.

148. see note 151 at 18.

149. idem at 20.

150. Energy, Mines and Resources Canada, The National Energy Audit Program, For Industry, Commerce and Institutions, Ottawa, Canada.

151. Energy, Mines and Resources Canada, National Energy Bus Program, Overview, 19R0260R, at 6.

152. T. McAdams and Elizabeth Dorn, Waste Exchanges: An Informational Tool for Linking Waste Generators with Users, in Making Pollution Prevention Pay, at note 98.

153. Dr. Robert Laughlin, Director of Canadian Waste Materials Exchange, Ontario Research Foundation, Toronto.

154. Dr. Robert Laughlin, The Methodology for the Operation of a Waste Materials Exchange in Canada, Solid Waste Management Branch Report, EPS 3-EC-77-8, Fisheries and Environment Canada, 1977 at 139-140. Some European exchanges have been in operation for over 10 years.

155. idem at 8.

156. idem.

157. personal communication with Dr. R.G.W. Laughlin, October 1983.

158. Canadian Waste Materials Exchange Annual Report, 1983, Table 9.

159. See A Survey and Analysis of State Policy Options to Encourage Alternatives to Land Disposal of Hazardous Waste, at note 89.

160. T.E. Crepeau & P.R. Bettz, "What Can We Learn from the Europeans on Waste Exchanges and Waste Management; Part I: Cross Frontier Waste Exchanges in Europe and the U.S.," Great Lakes Waste & Pollution Review Magazine, Michigan, Vol. 1, #14, Oct. 1983 at 19.

APPENDICES

A	CHART OF RESPONSES TO LETTER SENT TO CANADIAN PROVINCES AND SOME U.S. STATES AND SAMPLE QUESTIONS
B	D-RECT PROJECTS
C	IRAP CHARTS
D	ACCELERATED CAPITAL COST ALLOWANCE (ACCA) CLASSES 24, 27 UNDER THE FEDERAL INCOME TAX ACT
E	SAMPLE PRICES PAID FOR WASTE DISPOSAL
F	U.S. HAZARDOUS WASTE MANAGEMENT PROGRAM FEES
G	SUCCESSFUL RESPONSES TO CALIFORNIA DEPARTMENT HEALTH SERVICES INQUIRIES SENT DURING 1982 TO WASTE PRODUCERS
H	NATIONAL RECYCLING SYMBOL, ENVIRONMENT CANADA, 1984
I	N.Y. REPRESENTATIVE ENTRIES FOR PRELIMINARY HANDBOOK ON RECYCLING/RECOVERY
J	N.Y. TECHNICAL INFORMATION ASSISTANCE PROGRAM (DIAGRAM)
K	ACTIVE & PASSIVE WASTE EXCHANGES (DIAGRAM)

APPENDIX A

Questions posed to provincial environment
minister and some U.S. departments:

(i) What legislation or policies encourage industrial waste reduction and recycling in the (jurisdiction).

(ii) What is your department's mandate in the area of industrial waste reduction, recycling, recovery and reuse?

(iii) Are there any industrial waste recovery programs in operation in the jurisdiction) and if so who is sponsoring them (provincial government, municipal government, private sources)?

(iv) What is the impact of these programs and what has been the public and private sector response to these programs?

(v) What does your department consider major barriers to a successful industrial waste reduction, recycling, recovery program in the

(vi) In what areas of industry is industrial waste reduction, recycling, recovery considered most feasible at this time?

(vii) Has your department recommended any financial incentives, policies and or legislation to encourage industrial waste reduction, recycling, recovery in the Yukon? (egs. economic assistance programs; waste audit programs; high amortization rates for reduction, recycling, recovery equipment; provincial tax credits; stricter disposal regulations; increased fees for land burial)

(viii) Has your department received any response from industry or public interest groups on means of encouraging industrial waste reduction, recycling, recovery?

APPENDIX A

CHART OF RESPONSES TO LETTER SENT TO CANADIAN AND SOME AMERICAN JURISDICTIONS

Note: Some of chart is based on other sources as well. E.g. studies commissioned by department.
R/R = Recycling/Reduction Activities
Some provinces' responses were limited and were not included (New Brunswick; Yukon Territory)
Where a ----- is in chart space, means no response given or found.

	LEGISLATION OR POLICIES	DEPARTMENT OR AGENCY	PROGRAMS IN PLACE	MAJOR BARRIERS	WHERE RECYCLING AND REDUCTION MOST FEASIBLE	FINANCIAL/LEGAL INCENTIVES RECOMMENDED OR EXISTING	PUBLIC & INDUSTRIAL SECTOR RESPONSE
EBEC	Politique Quebecois de Gestion des dechets industriels - closed landfill sites in 1978 -treatment alternatives: incineration & solidification	Ministry of Environment	financial prog. $ from incineration & solidification contributed to Que. Ministry for programs (very recently in place)	Not specified	now evaluating recycling potential for plastics synthetic residues printing electrical components laboratory residues paints	cost of treatment has been increasing and % of $ goes to Quebec Ministry for programs	difficult to assess at this time
TARIO	Ont. Blueprint for Waste Management in Ontario	OWMC (Ont. Waste Management Corp.), Ministry of Environment, Waste Management Branch	Ministry of Env't has some progs. for res'l or comm'l waste: source separation prog. resource recovery prog. participates in Canadian Waste Materials Exchange Kitchener Info. Program on Waste Reduction	inertia, costs (Blueprint)	Most recent study on waste reduction opportunities was conducted by OWMC & examined potential in primary metals, chemical manufacturing, fabricated metal parts & recycling industry	none to date: Blueprint proposes $1 surcharge new site might bring higher treatment costs waste manifest could provide inventory of recyclables but not categorized	positive response to Canadian Waste Materials Exchange (CWME); mixed response on Blueprint proposed surcharge for landfilling
NITOBA	1983 Public Symposium on Hazardous Waste Management, recommends reduction, recycling, and reclamation (3R), should be long term basis of waste management program	Environmental Management Division/Manitoba Environment	CWME participation, waste audit to assess province's needs and required components of waste management	-lack of legislation -financial costs to small industry	Not specified	inventory system being developed under Dangerous Goods Handling Act; encourage industry to use CWME and local exchanges for smaller industries since least able to comply	public symposium (1983) had different sector representation and endorsed 3Rs as long term basis of waste management

APPENDIX A (continued)

	LEGISLATION OR POLICIES	DEPARTMENT OR AGENCY	PROGRAMS IN PLACE	MAJOR BARRIERS	WHERE RECYCLING AND REDUCTION MOST FEASIBLE	FINANCIAL/LEGAL INCENTIVES RECOMMENDED OR EXISTING	PUBLIC & INDUSTRIAL SECTOR RESPONSE
SKATCHEWAN	None Waste Management Branch established only very recently (1983)	Waste Management Branch/Health & Community Services	None	Not specified	Not specified	None	N/A
ALBERTA	- High pollution control stds under Clean Air Act; Clean Water Act - Moratorium on approvals of special waste treatment facilities (EPS Alta. policy statement) 1982	Waste Management Branch, Alberta Environment	-private programs -used lube oil recovery -empty pesticide container collection	-Transportation -Industrial attitudes -Capital costs -Landfill & treatment costs	electroplating solvent paint used oil photo-finishing	-may increase costs of treatment & disposal after site selection -waste inventory -new disposal regulations -waste exchange -used lube oil recycling program	----
BRITISH COLUMBIA	None regulations being developed to control transport, storage, treatment of "special wastes" which will impact on industrial sector	Provincial Waste Management Branch (limited staffing resources)	----	----	----	anticipate cost factor to industry will promote development of more efficient waste management systems and increase awareness of industrial potential in recycling	----
NOVA SCOTIA	Environmental Protection Act, Beverage Containers' Act, but not focussed on industrial waste	Department of the Environment	bark recovery waste heat recovery chemical recovery waste oil recovery paper, glass, metal	-market prices for recycled materials -costs of recovery program -local markets traditionally served by raw material products	paper glass waste oil asphalt chemicals	None	interest from industry in greater utilization of waste products CWME is used good industry response to requirements for paper, oil, glass, metal recovery
P.E.I.	None	Department of Community Affairs	-special wastes inventory -infrequent shipment of spent solvent out of province for shipping	small volume of waste generation; transportation legislation	----	----	industry operates on small scale; waste not as pressing a problem

APPENDIX A (continued)

	LEGISLATION OR POLICIES	DEPARTMENT OR AGENCY	PROGRAMS IN PLACE	MAJOR BARRIERS	WHERE RECYCLING AND REDUCTION MOST FEASIBLE	FINANCIAL/LEGAL INCENTIVES RECOMMENDED OR EXISTING	PUBLIC & INDUSTRIAL SECTOR RESPONSE
NEWFOUNDLAND	None specifically for R/R	Department of Environment	Dept. staff contacting mainland suppliers and disposal companies to encourage reuse & recycling	geographic isolation	-----	----	-----
NORTHWEST TERRITORIES	------	operate pursuant to Environmental Protection Ordinance	none by government some recycling by industry: arsenic removal from tailings & shipping of chemicals	-limited quanity -costs -distance -use of reused oil in breach of Clean Air Act.	----	-----	industry programs well received
FEDERAL	None specifically for RIR but greater support for encouraging RIR under Environment Canada mandate	Waste Management Branch, Environment Canada	-national recycling symbol -CWME -Kitchener-Waterloo Pilot Project	transportation attitudes costs technical problems landfill pricing	----	Federal Environment Minister Charles Caccia recently pushed for greater use of recycling and reduction in industry	
NEW YORK	Industrial Materials Recycling Act (IMRA)	industrial materials recycling program administered by Environmental Facilities Corporation, N.Y.	industrial materials recycling program(IMRP): -technical assistance -encourage adopt R/R processes to reduce hazardous waste & other waste where feasible -waste exchange	-attitude -increased regulation -costs	Least Feasible: Laboratory wastes	research education	positive
NORTH CAROLINA	Waste Management Act provides comprehensive legal framework based on economic growth without endangering environment, public health or safety	Department of Natural Resources & Community Development, North Carolina	Seminars, Conferences Established a Study Commission	----	electroplating textiles furniture	research/education activities proposed	positive

APPENDIX A (continued)

	LEGISLATION OR POLICIES	DEPARTMENT OR AGENCY	PROGRAMS IN PLACE	MAJOR BARRIERS	WHERE RECYCLING AND REDUCTION MOST FEASIBLE	FINANCIAL/LEGAL INCENTIVES RECOMMENDED OR EXISTING	PUBLIC & INDUSTRIAL SECTOR RESPONSE
ALIFORNIA	Health & Safety Code	Department of Health Services, California	several programs tied into comprehensive R/R strategy since 1980. Provided sufficient lead time to implement.	-disposal costs -technological -information	program focus on toxic wastes recyclability	-landfill phaseout -waste exchanges -listed recyclable wastes that must be recycled and not disposed by generator -financial incentives for small businesses -info. assistance	Positive
ASSACHUS-ETTS	Code of Mass. 1979 C.704,s.4, gives authority to develop tech. ref. centre, tech. assistance, promote R/R of hazardous wastes, encourage exchange	Department of Environmental Quality (DEQ) Massachusetts	-studies -conferences -source reduction advisory committee (public interest & business representation)	-ignorance by plant operators -difficulty obtaining capital -ignorance of cost-effectiveness -lack of technical assistance and of applied technology -diversity of ind'l processes -obsolete plant modules -perceived lack of public support -market uncertainties	solvent recovery	cost of disposal	unknown/response to concepts positive

APPENDIX B

D-RECT PROGRAM PROJECTS

LOCATION	PROJECT DESCRIPTION
Toronto/Ont.	Two compartment truck for retrieval of glass and newspaper.
Toronto/Ont.	Plant for cleaning waste glass for re-use as raw material.
Charlottetown/PEI	One hundred ton per day heat recovery incinerator plant.
Toronto/Ont.	Plant for cryogenic recycle of waste plastic and rubber.
Peterborough/Ont.	Plant for Mesophilic Anaerobic Digestion of Cattle manure.
Colborne/Ont.	Plant for composting municipal waste mechanically.
Surrey/B.C.	Plant for producing wood stove fuel cube from newspaper and coal fires.
Hamilton/Ont.	Steam to electricity generator for the Swaru Municipal waste incinerator.
Toronto/Ont.	Vehicle for cleaning and filtering waste oil for resale to generator.
Newmarket/Ont.	Use of earthworms to transform waste to soil additive.
Kincaid/PEI	Plant for producing ethanol from cull potato waste.
Pit Meadows/B.C.	System for shredding tires to produce rubber mats for stables.
Halifax/N.S.	Fluidized bed furnace for burning waste coal in homes.
Victoriaville/PQ	System for retrieving fine paper from schools.
Burlington/Ont.	Electrochemical reactor for recovering Cd, Cu and Zn from effluent.
Belleville/Ont.	Recovery of phenol and recirculation of distillater to make phenolic resins.
Maitland/Ont.	Mechanical compression system for evaporating water to recover ammonium nitrate.
St. Constant/PQ	System for burning rubber tires in a cement kiln.
Kitchener/Ont.	System for capturing methane from landfill and using it in industry.
Orangeville/Ont.	System to burn flax straw heat greenhouse.
Toronto/Ont.	System to recover and reuse chrome from effluent.
Granby/PQ	Anaerobic fermentation of cheese plant effluent.
Joliette/PQ	Plant to produce wood flour from wood waste.
Montreal/PQ	Shredder-compactor truck to retrieve confidential paper.
Winnipeg/Man.	Incinerator to burn wood waste.
Charlottetown/PEI	Utilization of waste sludge gas to produce electricity.

APPENDIX C
Industrial Research Assistance Program Proposals and Projects
From National Research Council, D.G.T. Cooper, IRAP-P Element Manager

Table I

Environmental Proposals and Projects

1967 - 83

	IRAP-M	IRAP-P	TOTAL
1) Projects Funded			
a) Commercial Success so far	6	15	21
b) Too early	6	8	14
c) Failed Comm	3	7	10
d) Total Projects	15	30	45
e) Total $000	353	5,193	5,546
f) % Success Projects (a/d)	40%	50%	47%
2) Proposals Rejected	5	5	10
a) % rejections: funded	25%	14%	22%

Table II

IRAP M & P

Environmental Proposals and Projects by Motive

IRAP ELEMENT	"M"				"P"			
Project Type	Recycle	Waste	Poll^n	Total	Recycle	Waste	Poll^n	Total
$000	118	25	106	249	609	820	1,394	2,829
Success: Total Projects funded	2/5	1/1	1/5	4/11	5/6	3/4	2/8	10/18
% Success – Total	40%	100%	20%	36%	83%	75%	25%	56%
– $	33%	100%	18%	37%	85%	78%	36%	59%
Proposals rejected	–	2	2	4	2	0	1	3
	R/W	WP	R/P	TOTAL	R/W	W/P	R/P	TOTAL
$000	20	30	54	104	0	1,121	1,243	2,364
Success: Total Projects funded	0/1	0/1	2/2	2/4	0/0	3/6	2/6	5/12
%Success – Project	0	0	100%	50%	0	50%	33%	42%
– $	0	0	100%	52%	0	51%	27%	38%
Proposals rejected	–	1	–	1	2	–	–	2

APPENDIX C (continued)

SUMMARY OF IRAP M & P ENVIRONMENTAL PROPOSALS AND PROJECTS

1967 - 83

PROVINCE	M/P & PROJECT #	TOPIC	PROJECT TYPE* R/W/P	FUNDED YES/NO	YEARS	COMMENTS SUCCESS
Alb	P-1072	Reclaim magnetic scrap.	R	50K	79-80	Yes, part of larger project
BC	P-1255	Grape wastes	P/W	300K	80-83	Yes, some products
C	1498M	Battery recycling	R	25K	82-83	No, company folded
BC	657M	Mercury recovery device	R	24K	79-80	No
BC	1290M	Film recovery for silver	R	20K	80-81	Yes, but company folded
BC	M-750	Coal dust control	P	No	82	Not funded but successful
BC	P-449	Whey	P/W	76+K	77-83	Yes
BC	P-298	Soda pulping	W	44K	74-76	Yes
BC	P-890	H_2S Pretreatment	P	234K	67-70	No
BC	M008	Bio reactor	W/P	No	78	No
BC	1848M	Bioreactor for waste water	W/P	30K (Est)	83+	Too early
BC	1084M	Water upgrading	P	25K	80-81	Do not know
Man.	M-451	Waste disposal	W	No	81	Not funded
NB	M-3160	Cedar waste	R/W	20K+	83-84	Just started
Nfld.	P-099	Pulp Looper diseased wood	R	92K	71-74	Yes, others show interest
Sask.	537-M	Cu contaminants in water	P	29K	81-2	Likely success
TOTAL	16			969K + 3 No's		6=Yes, 3=No 4=Too early, 3=Rejected

*R = Recycling
W = Waste reduction
P = Pollution Abatement

Dec. 1983

SUMMARY OF IRAP M & P ENVIRONMENTAL PROPOSALS AND PROJECTS

1967 - 83

PROVINCE	M/P & PROJECT #	TOPIC	PROJECT TYPE R/W/P	FUNDED YES/NO	YEARS	COMMENTS SUCCESS
Ont	P-1793	Oil Sand Waters	R/P	100+K	83+	Too early
Ont	1556P 1557P	Alcohol	R/W	No No	83 83	Too early Too early
Ont	31C8M	SO_2	P	20K+	83+	Too early
Ont	P-842	Food waste water	P/W	191K	65-71	Yes, strong benefits
Ont	P-1775	Waste Blood upgrading	R	180+K	83+	Yes, ongoing
Ont	P-072	Plating waste	P/R	217K	70-76	Yes, strong benefits
Ont	P-184	Reverse osmosis	R & P	276K	72-76	No
Ont	P-514	Selenium reduction	P	135K	78-82	Yes, strong benefits
Ont	P-1476	Metal recycling	R	18K	80-81	No, terminated
Ont	1704M	Water purification	R	30K	82-83	Likely: too early
Ont	3123M	Dust control	P	21K	83+	Too early
Ont	1075M	Sewage Treatment	W	25K	79-81	Yes
Ont	P-1890	Products from grape wastes	P/W	250K	83-84	Too early
Ont	P-538	Waste metal recovery	W/P	119K	78-81	No
Ont	P-1130	Water recycling	R/P	110K	80-82	No
Ont	693M	Liquid fertilizer from fish waste	R	19K	79-80	Yes
Ont	M-	Metal plating wastes	P	No	1981	Rejected
TOTAL ONTARIO	18			$1,711K + 3 No's		6=Yes, 4=No, 5=Too early, 3=rejected

APPENDIX C (continued)

SUMMARY OF IRAP M & P ENVIRONMENTAL PROPOSALS AND PROJECTS

1967 - 83

	PROVINCE	M/P & PROJECT #	TOPIC	PROJECT TYPE R/W/P	FUNDED YES/NO	YEARS	COMMENTS SUCCESS
	Que	P1340	Rennet recovery	P	443K	81-84	Too early
	Que	M-1596	Pig manure compost	R/P	28K	1982	Yes
		M-1839	Pig manure compost	R/P	26K	1983	Yes
	Que	P-	Colour removal - sulphite wastes	P	No	1981	No, company started & dropped it.
	Que	1496-M	filter bags	P	11K	1982	No, Co. folded
	Que	P-1087	BOD reduction	P	17K	1980-2	No, Co. folded
	Que	P-1629	Sulphite liquor	P	85K	1982	No, competing process.
	Que	P-175	Car metal recycling	R	$97K	72-80	Yes, New Plant
	Que	P-583	p.e. recycling	R	$100K(est)	78-81	Yes, part of longer project
	Que	P-290	Apple pomace	R/P	115K	74-80	Yes, new equipment space
	Que	P-2001	Waste carrot extraction	R	90K+	83+	Too early
	Que	P-1133	Metal stampings CAD/CAM	W	200K	80-83	Yes
	Que	P-410	Leather recycling	R	No	81-82	No, part of larger sucessful project.
	Que	P-004	SO_2 reduction	P	361K	70-74	Yes, Systems used in mills
	Que	P-186	Colour Removal	P	101K	73-76	Not yet.
	Que	P-391	Very high yield pulp (lower waste)	W	181K	76-79	Not yet.
	Que	P-103	Kraft pulp	W	401K	71-77	Yes
	Que	1629P	Recovery Boiler-sulphite	R	No	82	No, dropped since by Company also.
	Que	P-1056	Reverse Osmosis	W/P	185K	79-83	Not yet.
	Que	M-810	Waste inactivation.	W	No	83	Not funded
	Que	P-1209	Pulp mill waste use	P/R	425K	80-84	Not yet
TOTAL	QUEBEC	21			$2,866K + 4 No's		8=yes, 4=no 5=Too early, 4=Rejected

Class 24

(50 per cent)

Property acquired after April 26, 1965, and before 1971

(a) that would otherwise be included in Class 2, 3, 6 or 8 and that

(i) was acquired primarily for the purpose of preventing, reducing or eliminating pollution of

(A) any of the inland, coastal or boundary waters of Canada, or

(B) any lake, river, stream, watercourse, pond, swamp or well in Canada,

by industrial waste, refuse or sewage created by operations in the course of carrying on a business by the taxpayer or that would be created by such operations if the property had not been acquired and used, and

(ii) had not been used for any purpose whatever before it was acquired by the taxpayer,

but not including property acquired for use in the production of by-products or the recovery of materials unless the by-products are produced from, or the materials are recovered from, materials that after April 26, 1965,

(iii) were being discarded as waste by the taxpayer, or

(iv) were commonly being discarded as waste by other taxpayers who carried on operations of a type similar to the operations carried on by the taxpayer,

and property

(b) that would otherwise be included in another class in this Schedule

(i) that has not been included by the taxpayer in any other class,

(ii) that had not been used for any purpose whatever before it was acquired by the taxpayer,

(iii) that was acquired by the taxpayer after 1970 primarily for the purpose of preventing, reducing or eliminating pollution of

(A) any of the inland, coastal or boundary waters of Canada, or

(B) any lake, river, stream, watercourse, pond, swamp or well in Canada,

that is caused, or that, if the property had not been acquired and used, would be caused by

(C) operations carried on by the taxpayer at a site in Canada at which operations have been carried on by him from a time that is before 1974,

(D) the operation in Canada of a building or plant by the taxpayer, the construction of which was either commenced before 1974 or commenced under an agreement in writing entered into by him before 1974, or

(E) the operation of transportation or other movable equipment that has been operated by the taxpayer in Canada (including any of the inland, coastal or boundary waters of Canada) from a time that is before 1974,

or that was acquired by him after May 8, 1972, that would otherwise have been property referred to in this subparagraph except that

(F) it was acquired

(I) for the purpose of gaining or producing income from a business by a taxpayer whose business includes the preventing, reducing or eliminating of pollution of a kind referred to in this subparagraph that is caused or that otherwise would be caused primarily by operations referred to in clause (C), (D) or (E) carried on by other taxpayers (not including persons referred to in section 149 of the Act), and

(II) to be used in a business referred to in subclause (I) in the preventing, reducing or eliminating of pollution of a kind referred to in this subparagraph, or

(G) it was acquired

(I) for the purpose of gaining or producing income from a property by a corporation whose principal business is the purchasing of conditional sales contracts, accounts receivable, bills of sale, chattel mortgages, bills of exchange or other obligations representing part or all of the sale price of merchandise or services, the lending of money, or the leasing of property, or any combination thereof, and

(II) to be leased to a taxpayer (other than a person referred to in section 149 of the Act) to be used by him, in an operation referred to in clause (C), (D), (E) or (F), in the preventing, reducing or eliminating of pollution of a kind referred to in this subparagraph, and

(iv) that has, upon application by the taxpayer to the Minister of the Environment, been accepted by that Minister as property the primary use of which is to be the preventing, reducing or eliminating of pollution of a kind referred to in subparagraph (iii)

Class 27

(50 per cent)

Property that would otherwise be included in another class in this Schedule,

(a) that has not been included by the taxpayer in any other class,

(b) that had not been used for any purpose whatever before it was acquired by the taxpayer,

(c) that was acquired by the taxpayer after March 12, 1970 primarily for the purpose of preventing, reducing or eliminating air pollution by

(i) removing particulate, toxic or injurious materials from smoke or gas, or

(ii) preventing the discharge of part or all of the smoke, gas or other air pollutant,

that is discharged or that, if the property had not been acquired and used, would be discharged into the atmosphere as a result of

(iii) operations carried on by the taxpayer at a site in Canada at which operations have been carried on by him from a time that is before 1974

(iv) the operation in Canada of a building or plant by the taxpayer, the construction of which was either commenced before 1974 or commenced under an agreement in writing entered into by him before 1974, or

(v) the operation of transportation or other movable equipment that has been operated by the taxpayer in Canada (including any of the inland, coastal or boundary waters of Canada) from a time that is before 1974,

or that was acquired by him after May 8, 1972, that would otherwise have been property referred to in this paragraph except that

(vi) it was acquired

(A) for the purpose of gaining or producing income from a business by a taxpayer whose business includes the preventing, reducing or eliminating of air pollution that is caused or that otherwise would be caused primarily by operations referred to in subparagraphs (iii), (iv) or (v) carried on by other taxpayers (not including persons referred to in section 149 of the Act), and

(B) to be used in a business referred to in clause (A) in the preventing, reducing or eliminating of air pollution in a manner referred to in this paragraph, or

(vii) it was acquired

(A) for the purpose of gaining or producing income from a property by a corporation whose principal business is the purchasing of conditional sales contracts, accounts receivable, bills of sale, chattel mortgages, bills of exchange or other obligations representing part or all of the sale price of merchandise or services, the lending of money, or the leasing of property, or any combination thereof, and

(B) to be leased to a taxpayer (other than a person referred to in section 149 of the Act) to be used by him, in an operation referred to in subparagraphs (iii), (iv), (v) or (vi), in the preventing, reducing or eliminating of air pollution in a manner referred to in this paragraph and

(d) that has, upon application by the taxpayer to the Minister of the Environment, been accepted by that Minister as property the primary use of which is to be the preventing, reducing or eliminating of air pollution in a manner referred to in paragraph (c).

APPENDIX E
EXAMPLES OF PRICES PAID FOR WASTE DISPOSAL/TREATMENT

A. Rates Charged at Metro Toronto Landfill Sites*

Year	Charge/Tonne
1971	$ 3.15
1973	4.40
1975(July)	6.60
1976(July)	7.70
1978(")	8.80
1979(")	10.10
1980(")	10.42

*CUPE Brief on the Maple Landfill Site

C. Stablex Treatment*** 1983 (Canada)

(solidification treatment for inorganics)

$80-$800/metric tonne

Average price: $127/metric tonne

***personal communication, Glenn Douglas, Stablex, Canada, Dec,1983

B. Disposal Options: Going Rate(1980) ** In United States

	Price in U.S. Dollars	
	$/metric ton	$/drum
Sanitary Landfill	5-10	1-2
Secure Landfill		
Wastes which are not acutely hazardous, including sludges	20-90	4-18
Highly toxic, explosive or reactive chemicals	100-400	20-80
Incineration		
High BTU value, no acute hazard	50-300	10-60
Highly toxic, heavy metals	300-1000	60-200
Chemical Treatment		
Acids, alkalines	15-80	3-16
Cyanides, heavy metals, highly toxics	100-500	20-100
Resource Recovery	50-200	10-400
Deep Well injection		
Oily wastewaters	15-40	3-8
Dilute toxic rinsewaters	50-100	10-20

**Michael A. Verespej, " Time for decisions on Hazardous Waste", *Industry Week*, volume 209,#6, June 15, at 56

D. Tricil Treatment Prices 1983 (Canada) ****

Secure Chemical Landfill	$35	to $65	per cubic yard (approx 1 tonne)
Incineration	20¢	to 75¢	/galbon
Inorganic Waste Treatment	35¢	to 90¢	/gallon
Drummed	$48	to $64	/ drum
Solids			
Liquids	$48	to $100	/drum

****personal Communication with

APPENDIX F

Types of Hazardous Waste Management Program Fees, U.S.
From R.A. Finlayson, "Hazardous Waste Fee Systems",
Solid Wastes Management 25(9), 1982

State	FACILITY FEES				TRANSPORTER FEES	GENERATOR FEES			OTHER FEES
	Permit Application/ Facility Construction	Permit Renewal or Annual Operating Fees	Permit Modification Fee	Monitoring Surveillance Fee		Tipping Fee	Registration	Waste Generation Fee	
1. Arkansas	x	x	x	x	x				x
2. California					x	x			
3. Hawaii	x								
4. Indiana					x				x
5. Kansas	x			x	x				
6. Kentucky	x		x				x		
7. Louisiana	x	x							
8. Maryland	x	x							
9. Massachusetts	x				x				
10. Michigan	x	x			x				
11. Missouri	x	x			x	x		x	
12. New Hampshire	x	x			x				
13. New Jersey	x			x	x				
14. Ohio	x	x			x	x			
15. Oregon	x			x					
16. Puerto Rico	x		x		x				x
17. Rhode Island	x	x			x				
18. Tennessee	x	x			x				
19. West Virginia	x	x							
20. Wisconsin	x	x			x				
Number Implementing	18	12	5	4	14	3	1	1	3

APPENDIX G (continued)

Successful Responses to Departmental Inquiries Sent During 1982 to Waste Producers

Waste Stream Recycled	Amount Recycled, Tons*	Action Taken by Company
46. Oil	12	Outside recycler
47. 1,1,1-trichloroethane	8.8	Outside recycler
48. Xylene, resin	16	Outside recycler
49. 1,1,1-trichloroethane, acetone, Freon TF and T-WD 602	6	In-house recycled
50. Solvent and ink	38.7	Outside recycler
51. Various solvents	13.8	Fuel valve recovery by outside firm
52. Oil, acetone, methyl ethyl ketone, paint thinner	16	Outside recycler
53. 1,1,1-tricholorethane, Freon	1760 pounds	Outside recycler
54. Hydraulic fluid	10	Outside recycler
55. Wash thinner	3.2	Outside recycler
56. Paint thinner	1.4	Outside recycler
57. Methyl ethyl ketone	1.2	Outside recycler
58. Butyl acetate, xylene, alcohol	1600 pounds	Outside recycler
59. 1,1,1-trichloroethane	1600 pounds	Outside recycler
60. Acetone	16.8	Outside recycler
61. Proprietary solvent	2	Outside recycler
62. Ferric chloride	400 pounds	Outside recycler
63. Aromatics, aliphatics, ketones, acetates, miscellaneous	24	Outside recycler
64. Oil, water	12	Outside recycler
65. Empty 55 gallon drums	Variable	Outside recycler
66. Hydrochloric acid	24	In-house neutralized and outside recycler
67. Alcohol	8	
68. Solvent, oil	12.2	Outside recycler
69. Alcohol	2.6	Outside recycler
70. Hydraulic fluid	2	In-house recycled
71. Hexane	28	Outside recycler
72. Perchloroethylene	4.8	Outside recycler
73. Paint thinner	1.8	Outside recycler
74. Methyl ethyl ketone	880 pounds	Outside recycler
75. Oil	4	Outside recycler

APPENDIX G (continued)

Successful Responses to Departmental Inquiries Sent During 1982 to Waste Produ

Waste Stream Recycled	Amount Recycled, Tons*	Action Taken by Company
76. Oil, water	8	Outside recycler
77. 1,1,1-trichloroethane, alcohol, xylene	3.5	Outside recycler
78. 1,1,1-tricholorethane, Freon	19.5	Outside recycler
79. Oil	729.5	Outside recycler
80. Perchloroethylene	16	Outside recycler
81. Methyl ethyl ketone, trichloroethane, methylene chloride	14.4	In-house recycled
82. Perchloroethylene	11	Outside recycler
83. Freon TF	2.9	Outside recycler
84. Isopropyl alcohol, hexane, Freon	21.4	Outside recycler
85. Sulfur	622	Outside recycler
86. Dowclene	8	Outside recycler
87. 1,1,1-tricholorethane	105.6	Outside recycler
88. 1,1,1-trichloroethane	0.8	Outside recycler
89. Ketones, acetates, alcohol, aromatics, aliphatics	28.2	Outside recycler
90. Solvents	6.6	Outside recycler
91. Tricholorethane, alcohol	13	Outside recycler
92. Isopropyl alcohol and mixed solvents	19.2	Outside recycler

* Amount Recycled - is the total amount of hazardous waste recycled rather than disposed by generator. Actual amount reclaimed is not known. All amounts reported to the Department in volume were converted to a weight basis by the use of a conversion factor, 8 pounds per gallon. All numbers are in tons, unless otherwise indicated.

APPENDIX G (continued)

Table 2
Hazardous Wastes Recycled As a Result of the Department's Efforts (other than via letters of Inquiry)

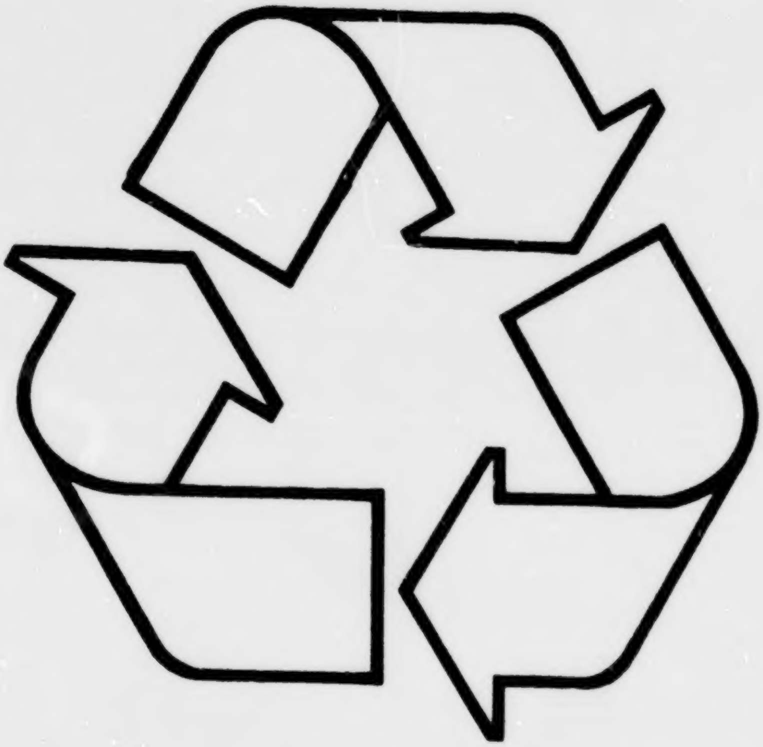
Waste Stream Recycled	Amount Recycled, Tons*	Action Taken by Company
1. Lime sludge	2,600	Outside recycler
2. Copper nitrate	40	Outside recycler
3. 11 cases of 24-32oz. bottles of 80% N-alkyl dimethylbenzyl ammonium chloride & 46 x 5 gallon pails of Roccal II	Unknown	Outside recycler
4. Laboratory chemicals	3 pounds	Outside recycler
5. 3M solvent/adhesive	240 pounds	Outside recycler
6. Sodium	400 pounds	Outside recycler
7. Oil, hydrocarbon solvent	800 pounds	Outside recycler
8. Various chemicals	100 pounds	Outside recycler
9. Reject fiber and primary and secondary paper sludge	7,000	Outside recycler
10. Vanadium pentoxide	1.2	Outside recycler
11. Resin sludge containing various solvents	40	In-house recycled
12. Waste solvents	24	In-house recycled
13. Cleaning solvents	69	Outside recycler
14. Trichloroethylene, trichloroethane	3.5	Outside recycler
15. Petroleum solvents	4.2	Outside recycler
16. Zinc	400	Outside recycler
17. Sulfuric and chromic acids	18	Neutralized and sewered
18. Various solvents and empty drums	470	Outside recycler
19. Spent sulfuric acid	145.6	Outside recycler
20. Empty 55 gallon drums	29	Outside recycler
21. Zinc sulfate solution	1,040	Outside recycler
22. Sulfur	2,600	Outside recycler
23. Lithium hydride	200 pounds	Outside recycler
24. Ammonium hydroxide, methyl ethyl ketone, acetone, methanol, miscellaneous solvents	920 pounds	Outside recycler
25. Unused, unopened paint	64 pounds	Outside recycler
26. Cleaning solvent	240 pounds	Outside recycler

APPENDIX G (continued)
Hazardous Waste Recycled As a Result of Department's Efforts (other than via letters of inquiry)

Waste Stream Recycled	Amount Recycled, Tons*	Action Taken by Company
27. Aluminum	2440 pounds	Outside recycler
28. Methyl ethyl ketone, toluene, and hexane	52.8 pounds	Outside recycler
29. Expired pyro copper plating solutions	6.2	Outside recycler
30. 1,1,1-trichloroethane	7.9	Outside recycler
31. Aliphatic thinner, toluene, chlorinated solvents, acetone, alcohol	9.1	Outside recycler
32. Phosphoric acid	19.2	Outside recycler
33. Wash solvent	336	Outside recycler
34. Acetone, xylene, isopropyl alcohol	19.2	Outside recycler
35. Benzene	0.9	Outside recycler
36. Freon TF, 1,1,1-trichloroethane, vacuum pump oil	66	Outside recycler
37. Mixed solvents	72	Outside recycler
38. Copper sulfate	4.5	Outside recycler
39. Sulfuric acid	336	Outside recycler
40. Solvent and paint residue	14.4	Outside recycler
41. Zinc sulfate	1440	Outside recycler
42. Hospital waste:xylene. isopropanol	18.7	Outside recycler
43. Freon TF, hexane, isopropanol	22	Outside recycler
44. Drums	3	Outside recycler
45. Water soluble cutting oil	48	Outside recycler
46. Heavy metals	9.6	Outside recycler
47. Paint sludge	72	fuel value recovery by outside firm
48. Paint solvents	56	Outside recycler
49. Solvent & paint sludge	960	Outside recycler
50. Surplus oil	800 pounds	Outside recycler
51. Denatured alcohol	1200 pounds	Outside recycler
52. Surplus chemicals	516 pounds	Outside recycler
53. Oil	1.54	Outside recycler
54. Perchloroetnylene	700 pounds	Outside recycler
55. Freon	440 pounds	Outside recycler

APPENDIX H

National Recycling Symbol,
Environment Canada, 1984



APPENDIX I

Sample Entries from New York Preliminary Handbook
on Recycling/Recovery of Wastes

TABLE 1. REPRESENTATIVE ENTRIES FOR PRELIMINARY HANDBOOK ON RECYCLING/RECOVERY OF WASTES FROM MAJOR SIC INDUSTRY CLASSIFICATIONS (Continued)

SIC	Industry Description	NYSDEC Inventory Waste Type(a)	Waste Designation	Probable Characteristics of Waste	Estimated Waste Quantities In New York State (Based on NYSDEC Inventory)(a)	Description of Potential Recycling or Recovery Techniques	Comments on Potential Value of Recycled/Recovered Waste Materials or By-Products, Demand, Economics, or Other Items
30	Rubber Products	612	Non-emulsified waste Oil	No specific data on composition are available. Waste streams may contain rotating machinery lubricating oils and spent machine oils.	35,000 gal (NOWS=7)	The fuel value of the waste oil may be utilized by mixing it with other wastes for burning in an incinerator or combustor.	Economics and demand for recycled recovered oils are generally attractive. Value for the recycled/recovered oil depends on its fuel value , purity, and transportation charges. Some recent observations indicate that this value could vary from $0.1 to $0.4 per gallon net to the waste oil generator.
311	Leather Tanning and Finishing Operations	645	Tannery waste	No specific data on composition are available. For example, spent tanning solutions contain chromic sulfate salts.	1,800,000 gal (NOWS=2)	Recycling/recovery potential cannot be assessed without detailed descriptions of particular waste stream characteristics.	See comments at left; demand and econom of recycling/recovery are uncerta

APPENDIX I (continued)

TABLE 1. REPRESENTATIVE ENTRIES FOR PRELIMINARY HANDBOOK ON RECYCLING/RECOVERY OF WASTES FROM MAJOR SIC INDUSTRY CLASSIFICATIONS (Continued)

SIC	Industry Description	NYSDEC Inventory Waste Type[a]	Waste Designation	Probable Characteristics of Waste	Estimated Waste Quantities In New York State (Based on NYSDEC Inventory)[a]	Description of Potential Recycling or Recovery Techniques	Comments on Potential Value of Recycled/Recovered Waste Materials or By-Products, Demand, Economics, or Other Items
311	Leather Tanning and Finishing Operations (Continued)	645				For example, recovery of chromic sulfate could be achieved by chemical/physical techniques involving precipitation of chromic hydroxide with caustic, filtration to segregate the chromic hydroxide, and subsequent acidification with sulfuric acid to regenerate chromic sulfate for use in the tanning processes.	
32	Stone, Clay, Glass, and Concrete Products	106	Other alkaline solutions (excludes alkaline solutions containing cyanide, heavy metals, other metals)	No specific data on composition are available.	471,200 gal (NOWS=2)	Reuse as acid neutralizing agent.	See comment at left; demand and economics will depend on solution strength and geographic location & needs for waste stream, etc.

APPENDIX I (continued)

TABLE 1. REPRESENTATIVE ENTRIES FOR PRELIMINARY HANDBOOK ON RECYCLING/RECOVERY OF WASTES FROM MAJOR SIC INDUSTRY CLASSIFICATIONS (Continued)

SIC	Industry Description	NYSDEC Inventory Waste Type(a)	Waste Designation	Probable Characteristics of Waste	Estimated Waste Quantities In New York State (Based on NYSDEC Inventory)(a)	Description of Potential Recycling or Recovery Techniques	Comments on Potential Value of Recycled/Recovered Waste Materials or By-Products, Demand, Economics, or Other Items
32	Stone, Clay, Glass and Concrete Products	304	Non-halogenated solvents (not including those with heavy metals and other metals)	No specific data on composition are available. The solvents may include: benzene, acetone, toluene, methanol, formaldehyde, isopropyl alcohol, butyl alcohol, etc.	1,501,200 gal (NOWS=2)	Fractional distillation or liquid-liquid extraction to recover specific components; some wastes could also be burned for fuel value.	See Appendix B.

APPENDIX I (continued)

TABLE 1. REPRESENTATIVE ENTRIES FOR PRELIMINARY HANDBOOK ON RECYCLING/RECOVERY OF WASTES FROM MAJOR SIC INDUSTRY CLASSIFICATIONS (Continued)

SIC	Industry Description	NYSDEC Inventory Waste Type(a)	Waste Designation	Probable Characteristics of Waste	Estimated Waste Quantities In New York State (Based on NYSDEC Inventory)(a)	Description of Potential Recycling or Recovery Techniques	Comments on Potential Value of Recycled/Recovered Waste Materials or By-Products, Demand, Economics, or Other Items
331	Blast Furnaces, Steel Works, Rolling and Finishing Operations	107	Spent pickle liquor from steel finishing operations	Spent pickle liquors from steel finishing operations generally run about 4-8% (wt) acid (i.e., generally sulfuric or hydrochloric), water about 10-15% (wt), ferrous sulfate or ferrous chloride plus small amounts of other metal salts (e.g., 20 ppm or less of Cr, Ni, or other metals)	12,400,000 gal 10,600 tons (NOWS=6)	Techniques may include neutralization, electrolysis, and reverse osmosis.	Neutralization may be more attractive than other techniques. Economics of recovery or recycling the waste will have to be evaluated for each technique.
331	Blast Furnaces, Steel Works, Rolling and Finishing Operations	613	Emulsified oil (more than 50% emulsified oil)	No specific data on composition available. Waste streams may contain spent rotating machinery lubricating oils and spent machine oils.	1,300,000 gal (NOWS=3)	Specific recycling/recovery techniques and potential cannot be assessed without detailed descriptions of particular waste stream characteristics. Dissolved air flotation is one technique that	Economics and demand for recycled and recovered oils are generally attractive. Value for the recycled/recovered oil depends on its fuel value, purity, and transportation

APPENDIX I (continued)

TABLE 1. REPRESENTATIVE ENTRIES FOR PRELIMINARY HANDBOOK ON RECYCLING/RECOVERY OF WASTES FROM MAJOR SIC INDUSTRY CLASSIFICATIONS (Continued)

SIC	Industry Description	NYSDEC Inventory Waste Type(a)	Waste Designation	Probable Characteristics of Waste	Estimated Waste Quantities In New York State (Based on NYSDEC Inventory) (a)	Description of Potential Recycling or Recovery Techniques	Comments on Potential Value of Recycled/Recovered Waste Materials or By-Products, Demand, Economics, or Other Items
331	Blast Furnaces, Steel Works, Rolling and Finishing Operations (Continued)	613				may be utilized for recovering the waste oil; incineration is another technique that may be used for recovering the fuel value in the waste.	charges. Some recent observations indicate that this value could vary from $0.1 to $0.4 per gallon net to the waste oil generator.
335	Rolling, Drawing and Extruding of Nonferrous Metals	612	Non-emulsified waste oil	No specific data on composition available; waste streams may contain spent rotating machinery, lubricating oils and spent machine oils.	165,000 gal (NOWS=4)	The fuel value of the waste oil may be utilized by mixing it with other waste in an incinerator or combustor.	Economics and demand for recycled recovered oils are generally attractive. Value for the recycled/recovered oil depends on its fuel value, purity, and transportation charges. Some recent observations indicate that this value could vary from $0.1 to $0.4 per gallon net to the waste oil generator.

APPENDIX I (continued)

TABLE 1. REPRESENTATIVE ENTRIES FOR PRELIMINARY HANDBOOK ON RECYCLING/RECOVERY OF WASTES FROM MAJOR SIC INDUSTRY CLASSIFICATIONS (Continued)

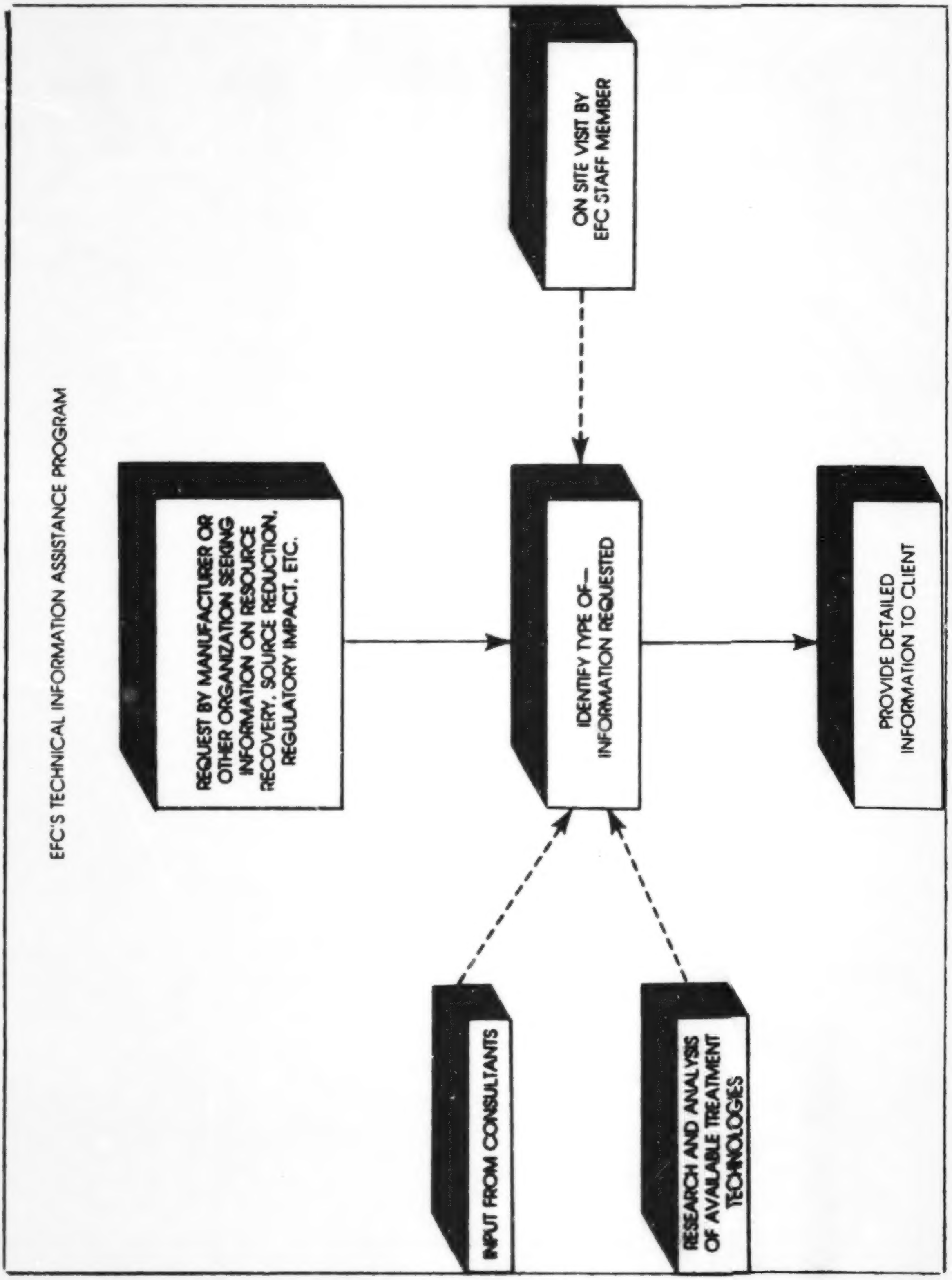
SIC	Industry Description	NYSDEC Inventory Waste Type(a)	Waste Designation	Probable Characteristics of Waste	Estimated Waste Quantities In New York State (Based on NYSDEC Inventory)(a)	Description of Potential Recycling or Recovery Techniques	Comments on Potential Value of Recycled/Recovered Waste Materials or By-Products, Demand, Economics, or Other Items
335	Rolling, Drawing, and Extruding of Nonferrous Metals	613	Emulsified oil (more than 50% emulsified oil)	No specific data on composition available; waste streams may contain spent lubricating or machine emulsified oils, heavy metals, oil spills, leaks, etc.	1,040,000 gal (NOWS-3)	Specific recycling/recovery techniques and potential cannot be assessed without detailed descriptions of particular waste stream characteristics. Dissolved air flotation is one technique that may be utilized for recovering the waste oil. Incineration is another technique that may be used for utilizing the fuel value in the waste.	Economics and demand for recycled recovered oils are generally attractive. Value for the recycled/recovered oil depends on its fuel value , purity, and transportation charges. Some recent observations indicate that this value could vary from $0.1 to $0.4 per gallon net to the waste oil generator.

APPENDIX I (continued)

TABLE 1. REPRESENTATIVE ENTRIES FOR PRELIMINARY HANDBOOK ON RECYCLING/RECOVERY OF WASTES FROM MAJOR SIC INDUSTRY CLASSIFICATIONS (Continued)

SIC	Industry Description	NYSDEC Inventory Waste Type(a)	Waste Designation	Probable Characteristics of Waste	Estimated Waste Quantities In New York State (Based on NYSDEC Inventory) (a)	Description of Potential Recycling or Recovery Techniques	Comments on Potential Value of Recycled/Recovered Waste Materials or By-Products, Demand, Economics, or Other Items
371	Motor Vehicles and Motor Vehicle Equipment Manufacturing	508	Heavy metal sludge	No specific data on composition are available. Waste streams may contain mercury, lead, chromium, cadmium, barium, selenium, arsenic, silver, copper, nickel, etc.	4,500,000 gal (NOWS=5)	Combination of chemical and physical techniques may be required to treat and recover some metal values. Techniques may include neutralization, precipitation, reduction, oxidation, filtration, etc.	See comments on left; recovery may be technically feasible but it may not be economically practical.
371	Motor Vehicles and Motor Vehicle Equipment Manufacturing	612	Non-emulsified waste oil	No specific data on composition are available; waste streams may contain spent rotating machinery, lubricating oils and spent machine oils.	1,200,000 gal (NOWS=8)	The fuel value of the waste oil may be utilized by mixing it with other waste for burning in an incinerator or combustor.	Economics and demand for recycled recovered oils are generally attractive. Value for the recycled/recovered oil depends on its fuel value , purity, and transportation charges. Some recent observations indicate that this value could vary from $0.1 to $0.4 per gallon net to the waste oil generator.

APPENDIX J - DIAGRAM - NEW YORK TECHNICAL ASSISTANCE PROGRAM


EFC'S TECHNICAL INFORMATION ASSISTANCE PROGRAM
REQUEST BY MANUFACTURER OR OTHER ORGANIZATION SEEKING INFORMATION ON RESOURCE RECOVERY, SOURCE REDUCTION, REGULATORY IMPACT, ETC.
ON SITE VISIT BY EFC STAFF MEMBER
IDENTIFY TYPE OF— INFORMATION REQUESTED
PROVIDE DETAILED INFORMATION TO CLIENT
INPUT FROM CONSULTANTS
RESEARCH AND ANALYSIS OF AVAILABLE TREATMENT TECHNOLOGIES

APPENDIX K - ACTIVE & PASSIVE WASTE EXCHANGES

(from New York Environmental Facilities Corporation, Industrial Materials Recycling Program, Annual Report, 1983)

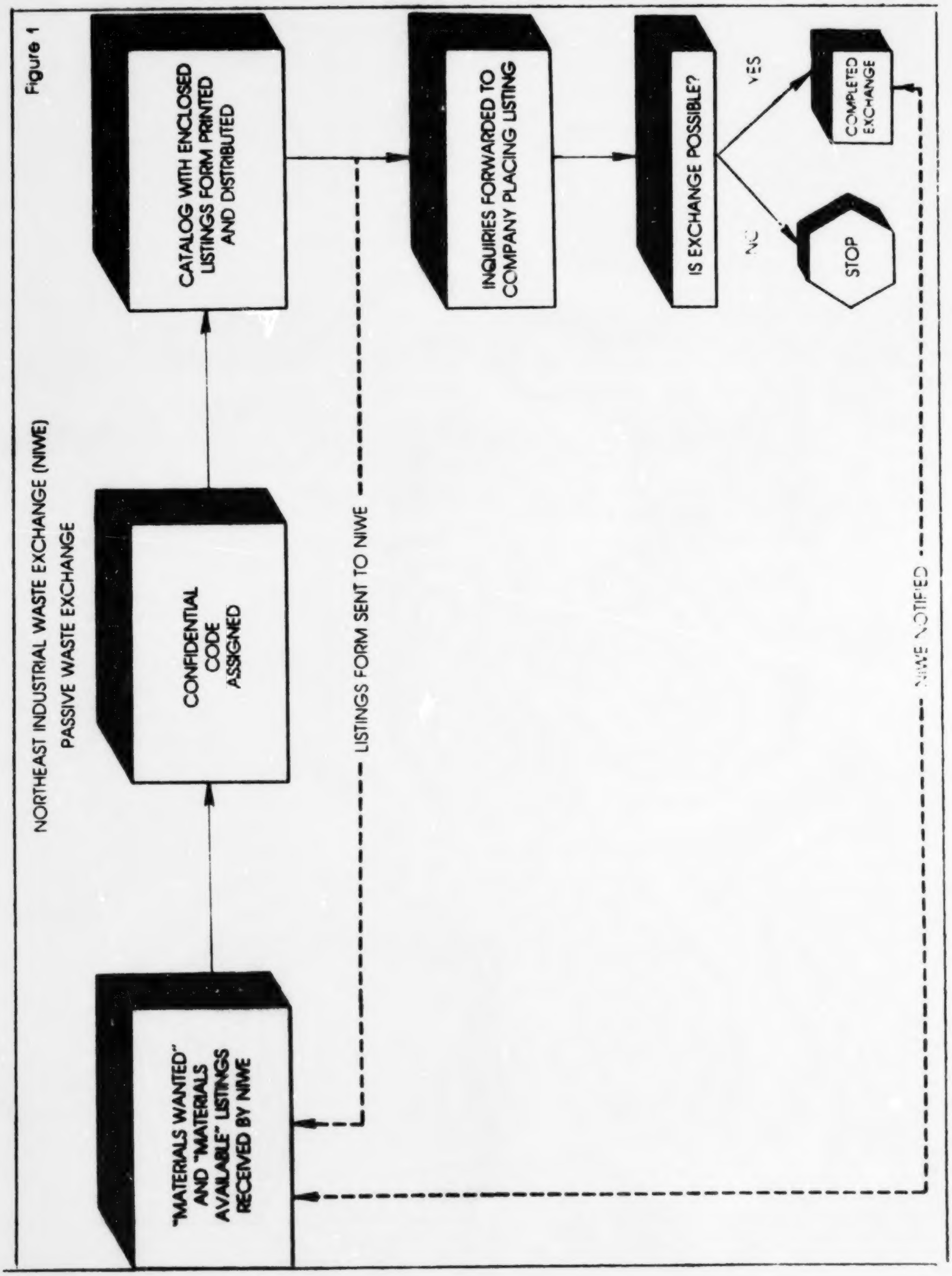


Figure 1
NORTHEAST INDUSTRIAL WASTE EXCHANGE (NIWE)
PASSIVE WASTE EXCHANGE
"MATERIALS WANTED" AND "MATERIALS AVAILABLE" LISTINGS RECEIVED BY NIWE
CONFIDENTIAL CODE ASSIGNED
CATALOG WITH ENCLOSED LISTINGS FORM PRINTED AND DISTRIBUTED
LISTINGS FORM SENT TO NIWE
INQUIRIES FORWARDED TO COMPANY PLACING LISTING
IS EXCHANGE POSSIBLE?
YES
NO
COMPLETED EXCHANGE
STOP
NIWE NOTIFIED

APPENDIX K - ACTIVE & PASSIVE WASTE EXCHANGES

(from New York Environmental Facilities Corporation, Industrial Materials Recycling Program, Annual Report - 1983)

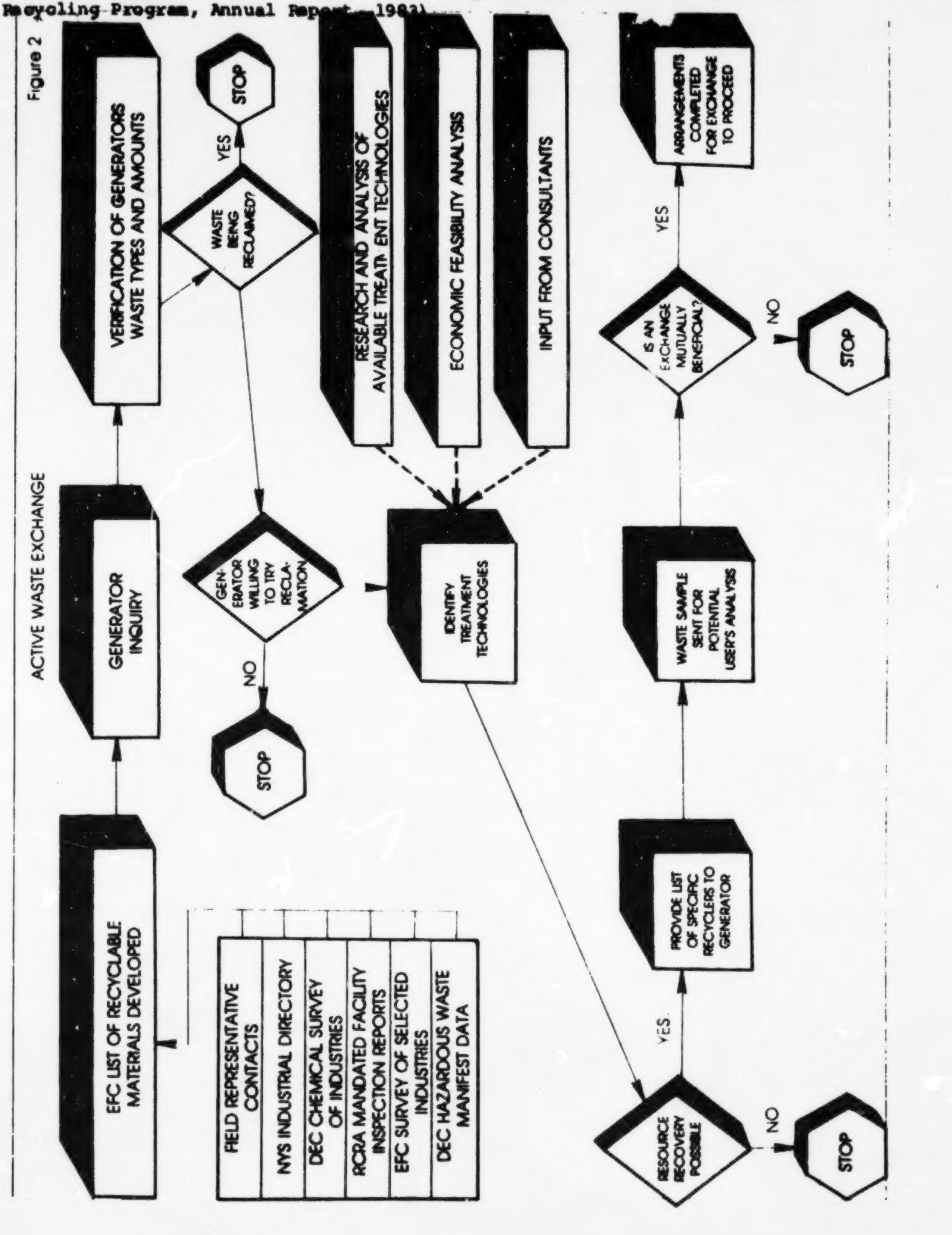


Figure 2
ACTIVE WASTE EXCHANGE
EFC LIST OF RECYCLABLE MATERIALS DEVELOPED
FIELD REPRESENTATIVE CONTACTS
NYS INDUSTRIAL DIRECTORY
DEC CHEMICAL SURVEY OF INDUSTRIES
RCRA MANDATED FACILITY INSPECTION REPORTS
EFC SURVEY OF SELECTED INDUSTRIES
DEC HAZARDOUS WASTE MANIFEST DATA
GENERATOR INQUIRY
VERIFICATION OF GENERATORS WASTE TYPES AND AMOUNTS
WASTE BEING RECLAIMED?
YES
STOP
GEN-ERATOR WILLING TO TRY RECLA-MATION
NO
STOP
RESEARCH AND ANALYSIS OF AVAILABLE TREATMENT TECHNOLOGIES
ECONOMIC FEASIBILITY ANALYSIS
INPUT FROM CONSULTANTS
IDENTIFY TREATMENT TECHNOLOGIES
RESOURCE RECOVERY POSSIBLE
NO
STOP
YES
PROVIDE LIST OF SPECIFIC RECYCLERS TO GENERATOR
WASTE SAMPLE SENT FOR POTENTIAL USER'S ANALYSIS
IS AN EXCHANGE MUTUALLY BENEFICIAL?
NO
STOP
YES
ARRANGEMENTS COMPLETED FOR EXCHANGE TO PROCEED

EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

1. Introduction

Pollution is more than an environmental problem. The generation and subsequent disposal of wastes has far-reaching effects on the economy, health, safety and on natural resources. These larger social problems are no longer adequately addressed through the use of conventional pollution control systems, regulations and laws. There is growing recognition of the need to overcome many of the environmental, health, safety and economic issues associated with present resource use through a preventative approach to production, consumption and disposal based on the minimum use of resources and the application of low or non-polluting technology.

An increasing number of companies have adopted preventative approaches to waste management by implementing at source reduction or recycling technology in their industrial processes. Many of these companies have found that through modifications in their production processes and waste management techniques they were able to meet control standards, alleviate waste disposal problems, increase process efficiency and save money. It is possible that several economic and legislative barriers have prevented many more companies from making the same changes.

2. Recycling and Reduction Potentials

There are varied estimates on the amounts and types of wastes that can be recycled. It is certain, however, that recycling and reduction activities can play a far greater role in waste management and pollution control than now.

There are also several broad policy reasons for addressing the need for waste minimizing strategies through recognized recycling and reduction, including:

(a) Resource Conservation
(b) Reducing environmental degradation
(c) Minimizing detrimental health effects
(d) Economic savings
(e) Promotion of a conserver approach to resource use

3. Low Waste Technology and Waste Management

The federal government and several provinces have endorsed the now well-established hierarchy for waste management. The hierarchy provides an optimal approach to waste management. There are marginal differences in the hierarchy adopted, but it is basically as follows:

(a) Do not generate the waste in the first place
(b) Recycle or reuse waste wherever possible
(c) Treat waste on the site of the generator
(d) Treat and/or dispose of wastes.

Low waste, non waste or clean technology are terms used to describe technologies designed to yield optimal efficiency of an industrial process and maximize the reduction of pollution at source in a cost efficient manner to substantially reduce or eliminate waste generation. Low waste, non waste or clean technology includes at source reduction, recycling or reuse activities.

The application of low waste technology is an important alternative to conventional waste management and pollution control practices. Low waste technology meets the top goals of the waste management heirarchy. The conventional regulatory response to waste and pollution has not afforded many opportunities for meeting the priorities of this strategy. But factors such as the rising cost of landfilling, increased feedstock costs, stricter pollution standards and growing concerns for environmental quality are now allowing greater consideration of waste reduction and recycling.

Cooperation and unity between jurisdictions on the application of the waste management hierarchy as the basis for a preventative approach would enhance the effectiveness of waste reduction and recycling strategies. There is also a need for agreement as to what is considered a recycling or reduction technology. Energy from waste or solidification projects are often the focus of alternative waste management programs although they do not promote at source reduction or recycling.

4. Barriers to reduction and recycling activities

A barrier is any one of a number of factors that restricts the use of recycling or reduction activities in industry. The barriers addressed here represent distinct areas where specific action could be taken to expand the use of recycling and reduction technology in industry. The specific barriers identified are:

(a) lack of financial incentives and disincentives
(b) incomplete waste disposal pricing
(c) pollution control standards
(d) lack of legislative schemes to promote recycling and reduction activities
(e) lack of information and awareness.

5. Lack of Financial Incentives

5.1 Introduction

Poor financial support for reduction and recycling activities in the industrial sector poses serious problems for smaller industries who have neither the internal capital nor research background to make the necessary investments to implement recycling or reduction equipment in their processes. In addition to the lack of fiscal incentives to encourage the use of low or non waste technology there are several fiscal disincentives that discourage its application in the industrial sector.

5.2 Direct Subsidies

There are some federal and provincial programs that are broad enough to provide direct funding for resource reduction and recycling projects. Only a few government programs provide assistance specifically for the implementation of recycling and reduction technology. These are D-RECT (the Development and Demonstration of Resource and Energy Conservation Technology), elements of IRAP (the Industrial Research Assistance Program), and IRDP (The Industrial Research Development Program). Funding for D-RECT in particular could be higher.

It appears that overall, not many requests are made for assistance in the area of capital investments for recycling and reduction technology. There are probably two correlating factors creating this trend. Assistance to industry in low waste technology research is not highlighted in broader industrial development financial programs. Also industry may not be aware of the availability of assistance from these programs or of the potential of recycling and reduction technology.

More funding for research and development specifically in the area of low waste technology and low interest loans to small business could provide meaningful assistance to companies investigating reduction and recycling. It would also be helpful if more funds were allocated to educational institutions to encourage research and specialization in the areas of clean technology. Industry, provincial and federal governments could contribute more to expanding the use of recycling and reduction in industrial processes through financial assistance, scholarships and research funds.

5.3 Indirect Incentives

Indirect incentives under income tax legislation could provide industry with useful tools for promoting recycling and reduction. Several taxation provisions discourage recycling and reduction and favour conventional technology and raw resource use.

For example, the accelerated capital cost allowance (ACCA) for pollution control equipment may assist industries to comply with stricter environmental standards by encouraging them to purchase pollution control equipment. It does not encourage investment in recycling or reduction technology. In order to be able to make use of this provision, which provides a rapid rate of write off or depreciation on pollution control equipment, the measure taken must have as its primary reason pollution control measures. Some applications under this provision have been rejected where recycling and reduction equipment has been installed. Because of substantial money savings in these cases it has been determined that the primary reason for the installation was not for pollution abatement but rather economic efficiency. This provision may not be available in situations where low waste technology is installed and there are consequent substantial money savings through cleaner operations in the process.

The current form of ACCA had some logic in addressing environmental strategies of the last two decades. It is now anomolous since it discourages recycling and reduction at a time when pollution prevention should be the focus of environmental strategies.

The Canadian re-refining industry has argued that re-refined oil ought to be exempt from the Excise Tax Act, which now levies a sales tax. It is argued that the source of used oil was initially taxed and in reimposing a tax on the re-refined product, the product is essentially being subjected to double taxation. With the additional sales tax on the re-refined product the price is comparable to that of crude oil and takes away the incentive that might have been available to the consumer to purchase that product. It has been stated by the re-refining industry that the amount collected by Revenue Canada through the imposition of this tax is drastically less than the amount of money taxpayers pay each year to replace over 200 million gallons of lost used oil.

There are other provisions under the Income Tax Act, such as depletion allowances, that implicitly support the use of raw resource industries and in that way discourage a shift to recycling and reduction.

5.4 Conclusions

The direct and indirect incentives and disincentives to recycling and reduction affect non waste technology practices in two ways. They drain investment capital from recycling and reduction activities in industry and rechannel capital into the raw resource industry which is favoured through our tax and economic structure. Secondly, fiscal incentives and discentives entrench the use of raw resources in industry through subsidies and again drain motivation from industry to more carefully explore recycling and reduction potentials. There is a real need for more research and development grants and other fiscal incentives to be directed to industry for recycling and reduction.

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6. Waste Disposal Pricing

6.1 Introduction

The low cost of landfilling waste has been a major obstacle to motivating industrial waste generators to adopt waste minimizing technologies.

There is general agreement among industry, waste management associations, environmentalists and government that the pricing structure for waste treatment is a major barrier to the use of alternative means for minimizing waste. As long as landfilling is relatively cheap, it is financially attractive for many industries to continue investment in the operating costs of disposal rather than in the initial high costs of implementing low waste technology.

6.2 The True Cost of Disposal

The price paid to dispose of waste is the amount paid by waste haulers or generators to dispose of the waste. The true cost includes social, environment, economic and other losses incurred for waste disposal in perpetuity. These include, for example, environmental degradation due to landfilling, loss of land, resource loss, health maintenance, and administrative costs. At this time, landfilling costs are largely subsidized by government and the public. Two arguments are raised as to what conditions will most effectively raise the cost of landfilling to reflect a cost closer to the true cost and increase the use of reduction and recycling technology.

The first argument is that the cost of landfilling will rise naturally as pollution control regulations and waste management regulations become stricter. This and other factors will gradually affect the cost so that the true cost will eventually be reflected. As the price for landfilling and treatment methods increases due to government regulation, scarcity of landfilling and high demand for services, industries will naturally turn to alternative waste minimizing technologies.

The second argument is that an added charge in the form of a user fee or levy should be imposed on the present price of disposal and treatment methods to raise the price to reflect a cost closer to the true cost. The money raised from the surcharge would then be applied to different programs to encourage recycling and reduction activities. It is contended that stricter requirements from government and other economic conditions are not sufficient to raise the cost to reflect true cost. Stricter regulatory demands may be necessary to meet evidence of the need for higher standards of environmental and health quality. These standards are not imposed to increase the cost of waste treatment but rather to promote environmental and health safety objectives.

A levy or surcharge is advantageous since it meets the problem of true cost directly. It has been used in various jurisdictions successfully. An added charge on the cost per ton of waste can act as a momentum to more quickly effect the changes that might otherwise occur only very slowly, if at all. The nature of our economic system has focussed on the excess use of raw resources, and pollution abatement has focussed on end of pipe controls. Without a surcharge to encourage a shift to preventative practices, it might otherwise be difficult to encourage these shifts in industrial waste management practices. There is also a real possibility that the natural rise in disposal price would be used only as a momentum to find more elaborate means of disposal in the ground and not to find methods of minimizing waste generation. A levy that is directed specifically to funding for recycling programs will guarantee the accessibility of assistance, information and programs on recycling and reduction opportunities for industry.

The motivation needed to encourage industry toward minimizing waste is based not only on awareness of the true cost of waste disposal, but also on the potential value of that waste as a coproduct. For this reason a surcharge used as an investment in waste minimizing technologies could be a valuable tool. As the cost of landfilling is raised to reflect the true cost, waste generators would become more aware of the real cost of waste. If the money levied is channelled into waste minimizing programs, industries that would otherwise not have resources immediately available to shift their waste management techniques, could have the information and incentives available to do so.

7. Pollution Control Standards

Companies may turn to low waste technology as they are obliged to modify equipment and processes to meet stricter environmental safety standards. More demanding pollution standards often create the external stimulus needed to motivate industries to apply low waste pollution technology which is more cost effective than conventional abatement solutions.

In Canada almost all water pollution control standards are negotiated on an ad hoc or case by case basis. There are only very few guidelines set down by law or regulation. Generally, environmental enforcement agencies rely on voluntary compliance, moral suasion and prosecution to have the objectives of environmental legislation met. Pollution standards could be even more effective in encouraging low waste practices if some of these problems were overcome.

Conventional pollution control is not the most efficient long term regulatory response to reducing environmental pollution. In conjunction with regular controls, some American states have begun to implement pretreatment standards. The application of pretreatment measures to contaminated waste can save land space for disposal, reduce ground water pollution and promote resource recovery through different chemical or physical treatments. The area of pretreatment needs to be examined further and the progress of American regulation should be studied.

Also it would be helpful to provide more information to environmental officers on at source reduction or recycling processes. Such information could be useful to industry and government in the process of negotiating environmental control orders.

8. Legislation

8.1 Introduction

Legislation that incorporates recycling and reduction activities can serve several important purposes. It can act as official recognition of the necessity of recycling and reduction as part of any waste management and environmental protection strategy. It can create a mandate on government agencies to administer a waste reduction policy. It can increase the awareness of all industrial sectors of recycling potentials and assist in coordinating individual efforts in this area. It can also provide numerous incentives and disincentives to quicken the shift in attitudes so that low waste practices become more favoured. Finally, it can serve to develop and support long term goals of environmental protection such as resource conservation, environmental and health safety, and economic self sufficiency.

Provincial and federal governments have been in the process of developing policies in the area of recycling and reduction. Legislation has not been passed to encourage these activities. Legislation could alleviate some of the problems inhibiting recycling and reduction activities in industry by:

1) providing a series of incentives in existing legislation to encourage non polluting technology;
2) creating a mandate on an appointed government body to carry out recycling and reduction objectives;
3) determining the degree to which an industry should be legally required to recycle;
4) developing protective provisions in areas such as trade secret protection, liability and purity standards.

Some piecemeal incentives and disincentives have either been proposed or passed and could assist in encouraging recycling and reduction technology. Some of the methods that can be used to create incentives to low waste technology include the use of the manifest system to identify or categorize recyclable materials, land burial restrictions and consumer product standards.

8.2 New York and California Legislation

Both New York and California have legislation that articulates clear policy objectives to encourage waste minimizing activities. These legislative packages served as the impetus for comprehensive information programs on recycling, reuse and reduction. The legislation also recognizes that greater opportunities exist for recycling and reduction and that further implementation depends largely on the coordinated effects of government and industry.

The California law includes a requirement on California waste generators to recycle their wastes where it is technologically and economically feasible to do so. The manifest system or tracking system has been applied to identify what wastes generators are able to recycle. When a waste that can be recycled is not reused, the generator is required to report to the California Department of Health Services. The department will then assist the generator in finding a way to rechannel the waste. If alternatives are found and the generator refuses to use them, it can be subjected to a fine through higher costs of disposal.

Requiring industrial waste generators to recycle wastes seems possible only where:

1) the technology is in place,
2) information is available to government and industry to make the requirement to recycle feasible and reasonable, for example through the use of the manifest system,
3) industry is given sufficient lead time to integrate reduction and recycling into their process.

A system similar to that in California could be developed in Canada when the manifest system is in place, if the system is used to identify materials that may be recycled. The California system allows for a cooperative approach on the part of industry and government to expand reduction and recycling opportunities.

A legislation package would help to promote low waste technology. Immediately, there is a real need to have a body specifically responsible for coordination of

(a) priorities to be given to land disposal alternatives;
(b) identification or categorization of wastestreams that can be recycled;
(c) directing further research;
(d) conducting recycling and reduction programs.

9. Lack of Information

9.1 Introduction

In Canada, as in other jurisdictions, the dearth of information available on waste minimizing techniques inhibits the development of reduction and recycling in industrial processes. The lack of references, information programs and tools to promote alternatives in waste management affects decisions by industry, government and consumers. In Canada, there are only a handful of information tools to assist in expanding an awareness of recycling and reduction potential of industrial waste.

9.2 Information Programs

For example, there are no general information programs to encourage recycling and reduction in the industrial sector in Canada. In the Kitchener/Waterloo area of Ontario, a waste information centre has been set up as part of a demonstration project for industrial waste recycling. The centre provides technical and other assistance, guidance to government agencies and other support that a company may need to improve its waste management practices. New York and California both have more extensive technical assistance programs available for industry and these have been met with positive response from industry.

Two useful information tools are waste audits and waste exchanges. A waste audit is an investigation of an industrial process to determine the amount of waste generated, the degree of hazardous components, the cost of disposal and the methods by which these wastes can be decreased either by identifying leaks or sources of material loss. The concept of waste audits could be encouraged more by industrial associations. It could also be integrated into waste management practices through law and policy. For example, the conduct of an audit could be imposed as a precondition to receiving environmental control permits.

An industrial waste exchange is a mechanism for connecting waste with companies that can reuse or reprocess it. It is a practical and practicable alternative to land disposal and is beneficial in:

(a) saving valuable resources;
(b) saving energy by not having to process raw materials;
(c) avoiding environmental damage;
(d) playing an educational role.

The Canadian Waste Materials Exchange (CWME) is a national, government funded waste exchange. The exchange employs only one half person per year and operates as a passive exchange, i.e. solely as a clearinghouse for information between waste sellers and buyers. Yet the replacement value of the total waste exchange annually is estimated at more than $5 million. Given its operational and financial restraints, the performance of CWME is exceptional. Better staffing for further research to overcome technical barriers of exchange and for more personalized networking of this service could increase the proportion of waste exchanged.

9.3 Conclusions

A comprehensive information program could significantly enhance the use of low waste technology in industry. It could break through much of the silence engendered within industry due to competition; expand government, industry and public awareness of the important role of low waste technology in any effective waste management strategy; assist government in assessing the feasibility of certain waste strategies; and assist in diverting waste streams from land disposal to more productive and conserving uses. Industrial associations and Chambers of Commerce could assist government by disseminating information on leading low waste technology and services, and on the financial assistance available.

10. Conclusions

Reduction and recycling have an important role to play in waste management. Opportunities exist to turn waste problems to our advantage, if steps are taken now to do so. The time has come for recognition of their significance through incentives: economic, financial, legal and institutional. The recommendations proposed in this paper are designed to act together to provide effective inroads to breaking the barriers to industrial waste reduction and recycling.